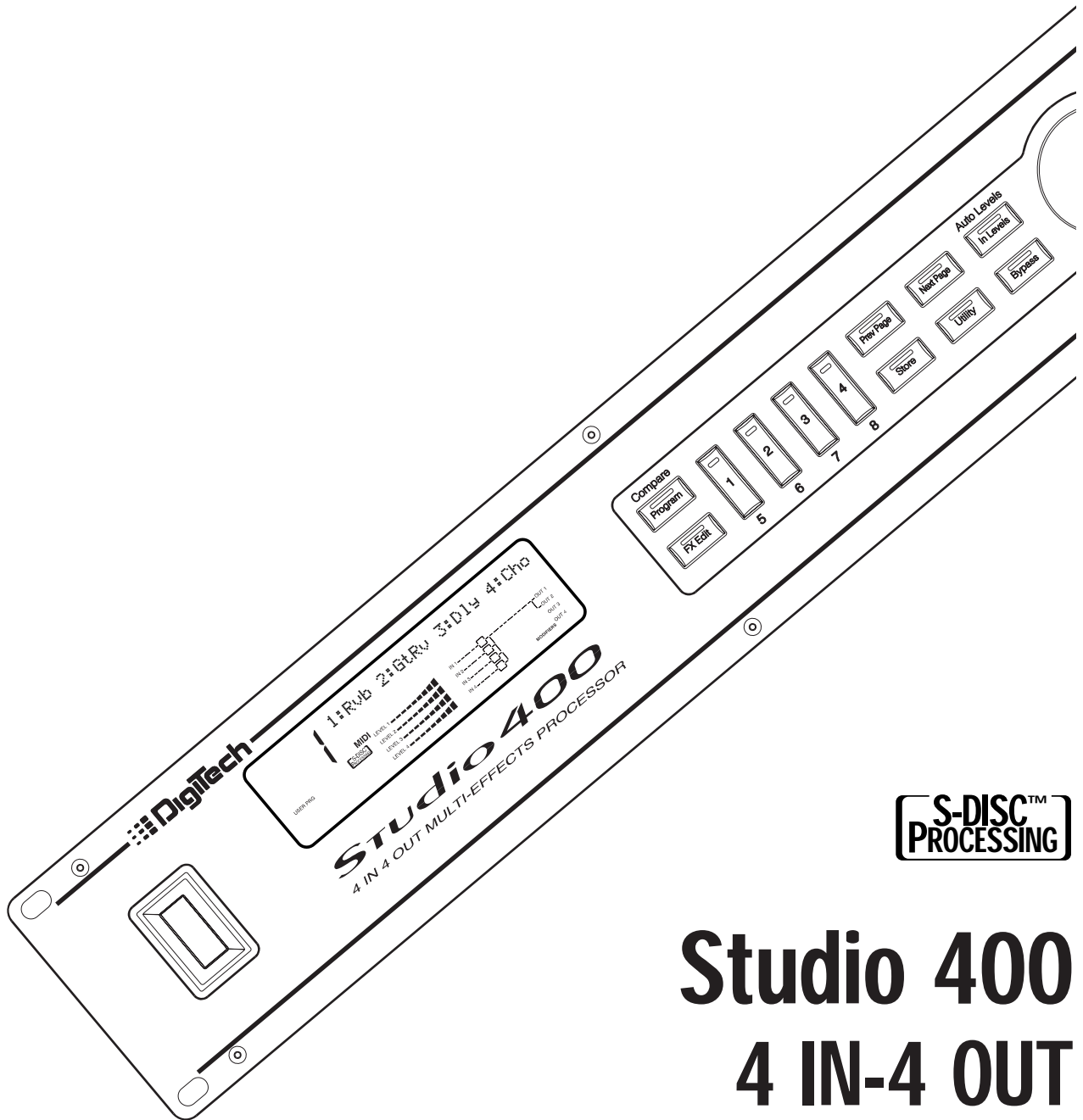




H A Harman International Company



Studio 400

4 IN-4 OUT

Professional Studio Effects Processor

Owner's Manual



WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE

The symbols shown at left are internationally accepted symbols that warn of potential hazards with electrical products. The lightning flash with arrowpoint in an equilateral triangle means that there are dangerous voltages present within the unit. The exclamation point in an equilateral triangle indicates that it is necessary for the user to refer to the owner's manual.

These symbols warn that there are no user serviceable parts inside the unit. Do not open the unit. Do not attempt to service the unit yourself. Refer all servicing to qualified personnel. Opening the chassis for any reason will void the manufacturer's warranty. Do not get the unit wet. If liquid is spilled on the unit, shut it off immediately and take it to a dealer for service. Disconnect the unit during storms to prevent damage.

U.K. MAINS PLUG WARNING

A moulded mains plug that has been cut off from the cord is unsafe. Discard the mains plug at a suitable disposal facility. **NEVER UNDER ANY CIRCUMSTANCES SHOULD YOU INSERT A DAMAGED OR CUT MAINS PLUG INTO A 13 AMP POWER SOCKET.** Do not use the mains plug without the fuse cover in place. Replacement fuse covers can be obtained from your local retailer. Replacement fuses are 13 amps and **MUST** be ASTA approved to BS1362.

LITHIUM BATTERY WARNING

CAUTION!

This product contains a lithium battery. There is danger of explosion if the battery is incorrectly replaced. Replace only with an Eveready CR 2032 or equivalent. Make sure the battery is installed with the correct polarity. Discard used batteries according to manufacturer's instructions.

ADVARSEL!

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved feilagtig håndtering. Utskiftning må kun ske med batteri av samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

VAROITUS!

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

WARNING!

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparatillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

IMPORTANT!

FOR YOUR PROTECTION, PLEASE READ THE FOLLOWING:

WATER AND MOISTURE: Appliance should not be used near water (e.g. near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc). Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

POWER SOURCES: The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

GROUNDING OR POLARIZATION: Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

POWER CORD PROTECTION: Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

SERVICING: The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

FUSING: If your unit is equipped with a fuse receptacle, replace with only same type fuse. Refer to replacement text on the unit for correct fuse type.

DECLARATION OF CONFORMITY

Manufacturer's Name: Harman Music Group Incorporated

Manufacturer's Address: 8760 S. Sandy Parkway
Sandy, Utah 84070, USA

declares that the product:

Product Name: Studio 400

Product Options: All

conform to the following Product Specifications:

Safety: EN 60065 (1993)
IEC 65 (1985) with Amendments 1, 2 & 3

EMC: EN 55013 (1990)
EN 55020 (1991)

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC as amended by Directive 93/68/EEC.

Digitech Electronics
President of Digitech
8760 S. Sandy Parkway
Sandy, Utah 84070, USA

Effective October 1, 1996

European Contact: Your Local DigiTech Sales and Service Office or

International Sales Office
3 Overlook Drive #4
Amherst, New Hampshire 03031, USA
Tel (603) 672-4244
Fax (603) 672-4246

Table Of Contents	1
Introduction	2
Warranty	2
SECTION 1 - SETTING UP	3
Unpacking the Studio 400	3
Suppling Power	3
Front Panel Controls	3
Rear Panel Controls	5
Making Connections	6
A Word About Bypass	8
SECTION 2 - BASIC FUNCTIONS OF THE STUDIO 400	9
Getting Around the Operating System	9
Program Mode	9
FX Edit Mode	9
Selecting FX Types and Defaults	9
Modifying FX Module Parameters Example	10
Input/Output Configurations	11
Using Modifiers	11
Linking a Parameter to a Modifier	12
Setting up an LFO or Dynamic	13
Comparing Programs	14
Storing Programs	14
SECTION 3 - EFFECTS AND PARAMETERS	15
About Modules and the Effect Charts	15
About the Charts	15
Reverbs	16
Chorus and Flange	19
Phasers	22
Tremolos, Auto Panners and Rotary Speaker Simluator	23
Detuners and Pitch Shifters	23
Delays	26
EQs	27
Noise Gate and Compressor	28
Multi Effects	29
SECTION 4-IN LEVELS AND UTILITIES	30
Auto/Manual Input Leveling	30
Utility	31
Adjusting the Screen Contrast	31
MIDI Channel	31
Program Map	32
System Exclusive device channel / MIDI Merge	32
Program Dump	33
System Exclusive Bulk Dump	33
System Dump	33
Program Autoload	34
Factory Reset	34
Harmony Tuning Reference	35
SECTION 5- APPENDIX	36
MIDI Implementation Chart	36
Effects and Defaults List	37
Effect Configuration Chart	38
Factory Program List	39
Studio 400 Specifications	41
Harmony Interval Charts	42
User Notes	43

INTRODUCTION

Congratulations, and thank you for your purchase of the DigiTech Studio 400.

The Studio 400 gives you four completely independent inputs and outputs driven by proven Dual S-DISC™ technology. The results are obvious: sparkling clean sound and endless combinations of effects and signal path routings. Features include:

- Balanced 1/4" and XLR Inputs and Outputs
- Dual S-Discs
- Optional Digital I/O Interface
- 8 Effects at once
- 24 bit data path
- 191(Factory) 100(User) Programs
- Effects include: Reverbs, Choruses, Flangers, Auto-Panners, Tremolo, Intelligent Pitch Shifting, Delays (Analog and Digital), Rotary Speaker Simulator, Compressor, and Noise Gate.

WARRANTY

1. The warranty registration card must be mailed within ten days after purchase date to validate the warranty.
2. DigiTech warrants this product, when used solely within the U.S., to be free from defects in materials and workmanship under normal use and service.
3. DigiTech liability under this warranty is limited to repairing or replacing defective materials that show evidence of defect, provided the product is returned to DigiTech WITH RETURN AUTHORIZATION, where all parts and labor will be covered up to a period of one year. A Return Authorization number may be obtained from DigiTech by telephone. The company shall not be liable for any consequential damage as a result of the product's use in any circuit or assembly.
4. Proof-of-purchase is considered to be the burden of the consumer.
5. DigiTech reserves the right to make changes in design, and make additions or improvements to this product without incurring any obligation to install the same on products previously manufactured.
6. The foregoing is in lieu of all other warranties, expressed or implied, and DigiTech neither assumes nor authorizes any person to assume any obligation or liability in connection with the sale of this product. In no event shall DigiTech or its dealers be liable for special or consequential damages, or from any delay in the performance of this warranty due to causes beyond their control.

DigiTech™, Studio 400™, and S-DISC™ are registered trademarks of DOD Electronics Corporation.

IMPORTANT! The information contained in this manual is subject to change at any time without notification. Some information in this manual may also be inaccurate due to undocumented changes in the product or operating system since this version of the manual was completed. The information contained in this version of the manual supersedes all previous versions.

SECTION 1 - SETTING UP

UNPACKING THE STUDIO 400

Your Studio 400 was carefully assembled and packaged at the factory. Before you proceed any further, make sure the following items are included:

- (1) Owner's manual
- (1) DigiTech Studio 400 Studio Effects Processor
- (1) Power cord
- (4) Rack screws
- (1) DigiTech warranty card

Please save all packaging materials. They were designed to protect the unit from damage during shipping. In the unlikely event that the unit requires service, use only the factory supplied carton to return the unit.

SUPPLYING POWER

The Studio 400, like any piece of computer hardware, is sensitive to voltage drops, spikes and surges. Interference such as lightning or power "brownouts" can seriously, and in extreme cases, permanently damage the circuitry inside the unit. Always be sure to connect your Studio 400 to well grounded AC outlets. You may wish to use a Spike/Surge Suppressor or AC Line Conditioner to further protect your investment.

FRONT PANEL CONTROLS

The layout of the Studio 400's front panel is simple and straightforward. Figure 1-1 shows the various parts of the Studio 400.

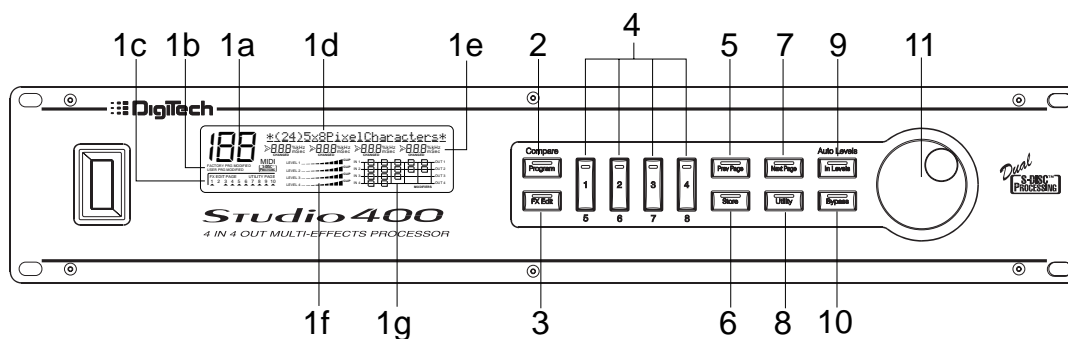


Figure 1-1 Front Panel

1) DISPLAY - The Studio 400's large custom display is where you get most of the information you need to move around the operating system. The display has several important sections that you need to understand when you use the Studio 400. They are:

1a) Program Number Indicator - These three large digits in the upper left corner of the display indicate which Program is currently selected.

1b) Factory / User Indicators - Directly below the Program number are the Factory and User Program indicators. These indicators also include a CHANGED icon to tell you whether the Program has been modified but not stored in memory. Factory Programs can be modified but must be stored in a User Program location since Factory Programs cannot be overwritten.

1c) Page Indicators - The bottom left corner of the display is occupied by the Page indicators. They display the number of Pages available and the Page which is currently selected. These icons only appear in the FX Edit and Utilities modes.

1d) Information Line - This row of 24 characters (top line of the display) is the Information line. It gives more detailed information about specific functions and items, and contains things like Program names, Parameter names, and Utility or auxiliary information.

1e) Parameter Data Sections - There are four Parameter Data sections in the display. They are immediately below the Information line, and correspond with the <1> through <4> buttons on the front panel. Each section displays the current value of the indicated Parameter. Each section also has an arrow that shows which Parameter in the display is selected.

A CC indicator in each group tells whether the indicated Parameter is set up to be continuously controlled ("continuous control" includes internal LFOs, dynamic modifiers, and MIDI continuous controller data). Directly below each section is a CHANGED indicator that lights to indicate that the Parameter has been changed but not stored.

1f) Input Level / Clip Meters - The bottom center of the display is occupied by the Input Level and Clip meters. These meters show the input level of each channel, and use a peak detector action to display the highest levels at the inputs. The Clip indicator at the end of each meter shows whether the input signal is being clipped at the analog input section (pre-digital).

1g) Effect Routing Matrix - The Effect Routing Matrix shows the signal flow of the currently selected Program. This matrix includes boxes that represent each effect module along with lines that indicate how those effects are connected to inputs, outputs and each other. If an effect module is bypassed, a line appears through that module's box in the Matrix.

When in FX Edit mode, the box that represents the currently selected effect module will flash. Likewise the Modifier module flashes the MODIFIER indicator, the Input Mode module flashes the Input Routing indicators and the Output Mode module flashes the Output Routing indicators.

2) PROGRAM BUTTON - Selects Program mode for Program selection. The Data Wheel is used to select a program for loading. The Program button can also be used to toggle between the User or Factory Program Banks. The active Program Bank is shown in the display by the Factory / User indicators (see item 1b).

This button is also used to access the Compare mode. See pg. 14 for more information.

3) FX EDIT BUTTON - Selects FX Edit mode for Program modification. If you continue to press this button, you will scroll through each individual effect module, the Modifiers module and the Input/Output modules.

4) PARAMETER BUTTONS - The Parameter buttons <1> through <4> are used to select the Parameter or Utility item you want to edit. In Program mode, they can also be used to enter the FX Edit mode's 1st through 4th module. To access modules 5 through 8, simply press and hold parameter buttons <1> through <4> accordingly.

5) PREV PAGE BUTTON - Scrolls to the previous Page in the Parameter list. Note that the Page indicators change to reflect the currently selected Page number in the Parameter list.

6) STORE BUTTON - The <STORE> button is used to store user Programs in memory for later recall.

7) NEXT PAGE BUTTON - Scrolls to the next Page in the Parameter list. Note that the Page indicators change to reflect the currently selected Page number in the Parameter list.

8) UTILITY - Selects the Utility mode where global functions such as Screen Contrast, MIDI Channel, Program Maps, SysEx Channel, SysEx Dumps, Program AutoLoad and Reset can be accessed.

9) IN LEVELS - This button is used to access both the automatic and manual input leveling controls. For more on setting input levels, see pg. 30.

10) BYPASS - Bypasses all the effects in the Studio 400.

11) DATA WHEEL - The Data Wheel lets you scroll through Programs and change Parameters values.

REAR PANEL CONNECTIONS

The layout of the Studio 400's simple and straightforward rear panel is illustrated in Figure 1-2.

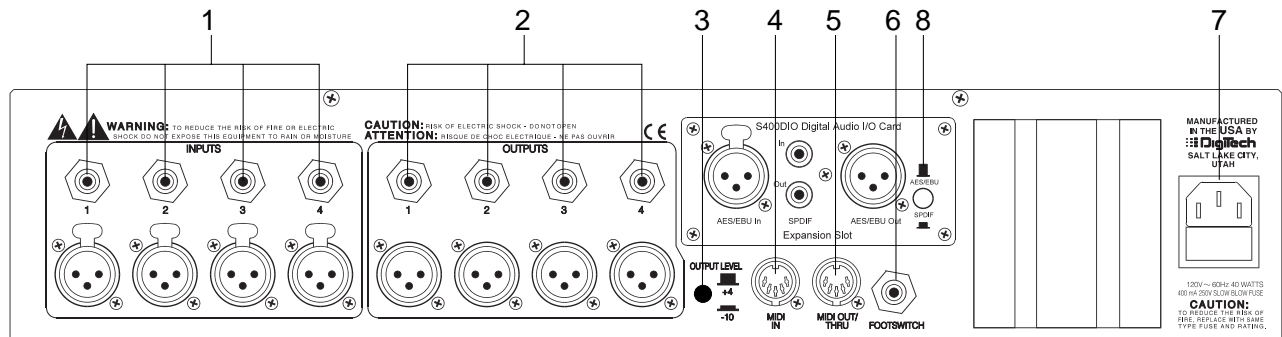


Figure 1-2 Rear Panel

1) AUDIO INPUTS - These four XLR or 1/4" balanced inputs can be used for several different combinations of input configurations. The Input Configuration module of each Program defines how each Input is used. See pg. 11 for more info.

2) AUDIO OUTPUTS - The Studio 400's XLR and 1/4" balanced outputs can also be configured in many different ways. These settings are found in the Output Configuration module of each Program. See pg. 11 for more info.

3) OUTPUT LEVEL SWITCH - Selects whether the signal is nominally output at line level (-10 dB) or at professional level (+4).

WARNING: Make sure the Studio 400's audio levels are all down before changing the setting of this switch. Also, be sure you know which setting is best for your particular equipment setup, as setting this switch to +4 can overload the inputs of some line-level equipment. DigiTech is not responsible for any damage to speakers or components due to misuse of this switch.

4) MIDI IN - MIDI data is received at this port. When MIDI data is received, the MIDI indicator in the display flashes on and off.

5) MIDI OUT / THRU - Merges MIDI data generated by the Studio 400 with MIDI data received at the input. Please see pg. 32 for more information.

6) FOOTSWITCH - This jack allows connection of the DigiTech FS300 3-button footswitch or any shorting-type footswitch. If using the DigiTech FS300, button 1 increments through Programs, button 2 decrements through Programs, and button 3 bypasses the Studio 400's effects. When using any other single momentary switch device, the switch acts as a Bypass.

NOTE: The footswitch must be plugged in on power up in order for the Studio 400 to detect which type of switch is being used.

7) POWER INPUT - Connect power supply cord to AC Line input jack on the rear of the Studio 400.

8) DIGITAL I/O - Optional Upgrade. See pg. 8 for more info.

MAKING CONNECTIONS

Because of its flexibility, the Studio 400 can be connected in several different ways to meet the requirements of specific applications. The following diagrams offer some ways the Studio 400 can be connected.

IN LINE: The Studio 400 can be connected between a line level instrument output (such as keyboards, recording decks, etc.) and a line level input (such as mixing console inputs). This method is called the "in-line" method because the Studio 400 is connected directly in the audio path of the source. When you use the in-line method, the master wet-to-dry effects mix is controlled from the Studio 400 operating system. Cable routings for this method looks like Figure 1-3:

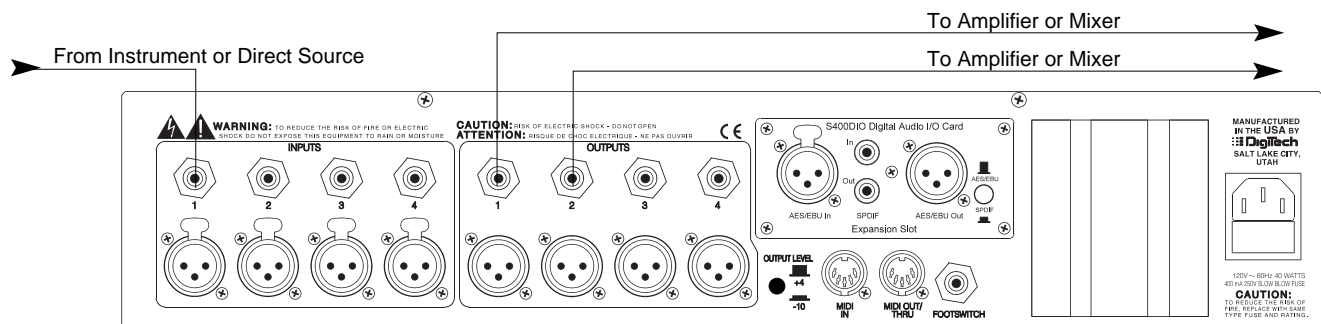


Figure 1-3 In-Line Connection

EFFECTS LOOP: This application uses the Studio 400 in an effects loop of a mixing console. In this application, the source is routed directly to the mixer channel input(s). From there, the Studio 400 gets its source audio from the console's auxiliary send, and mix levels are controlled directly from the console. Figure 1-4 shows a common recording studio or live sound reinforcement setup for effects processing with a console.

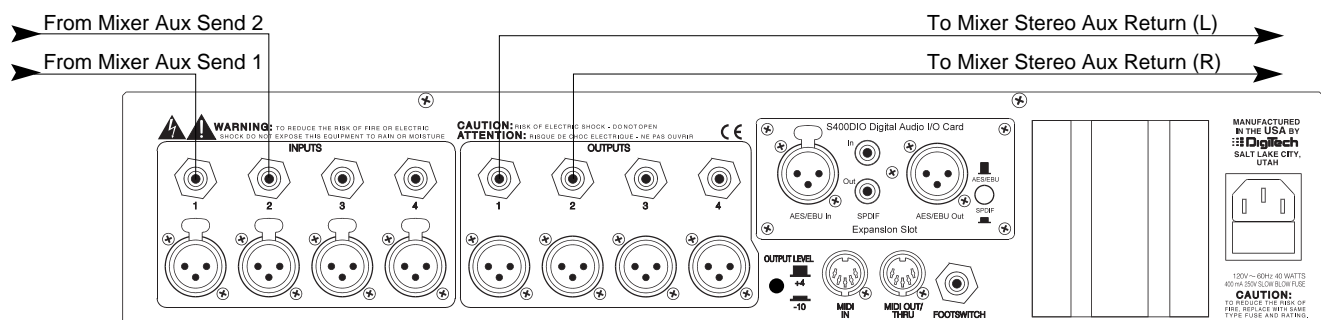


Figure 1-4 Effects Loop Configuration

Figure 1-5 shows an example of a typical stereo effect setup as seen from the console, and shows how to handle both true stereo and mono input signals using two auxiliary sends.

This is the method of choice in many recording applications because of the impressive realism and depth of texture that it produces. While it is slightly more complicated to set up and requires twice as many auxiliary sends, stereo effects (particularly reverbs) improve dramatically in imaging and spaciousness.

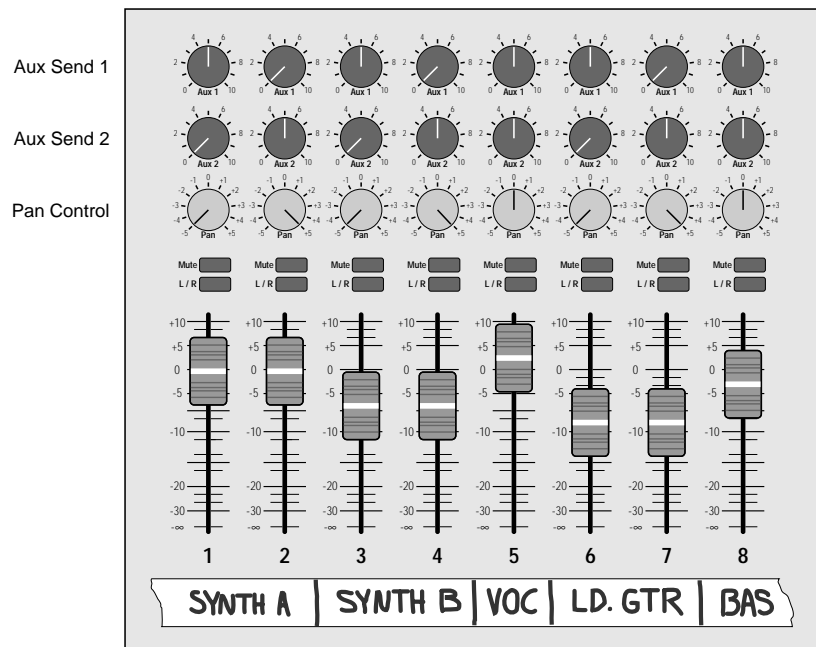


Figure 1-5 Setting up a mixer's aux sends for true stereo operation

REMEMBER: When you use this method to process stereo sources such as keyboards, the auxiliary sends on your console should be set up exactly opposite one another, as shown on channels 1 and 2 of Figure 1-5. Note that the left channel is sent to Aux 1, while the right channel is sent to Aux 2. When using mono sources like vocals and bass guitar, send equal levels from both Aux 1 and Aux 2 to maintain proper soundfield balance of the effects, as shown on channels 5 and 8.

PARALLEL EFFECTS: Another application for the Studio 400 allows you to independently process four discrete signals simultaneously. This method also utilizes the effects loops of your console, and since each effect has a mono input, the auxiliary sends can be set up in a much more straightforward way. Figure 1-6 on the following page, shows how to connect the Studio 400 for this application.

8

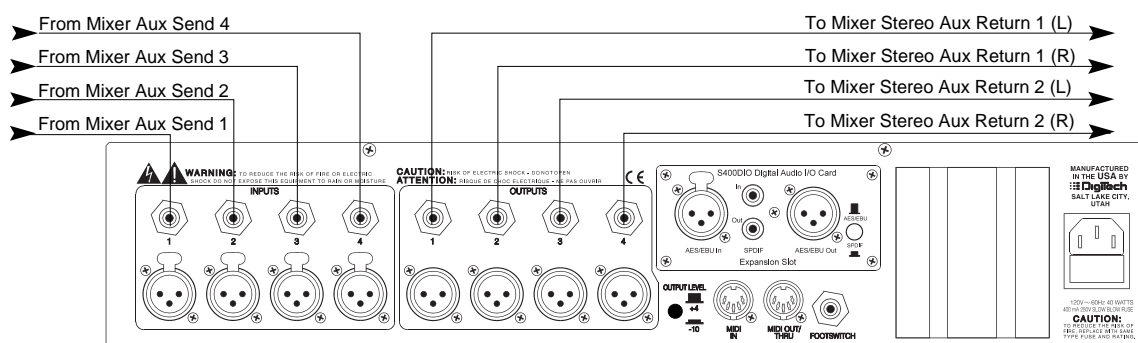


Figure 1-6 Quad Mono Input / Dual Stereo Output Configuration

Using this method, you could use channel 1 for a long vocal reverb, channel 2 for a short gated snare drum reverb, channel 3 for lead guitar delay, and channel 4 to thicken keyboard instruments with a detuner. This method also offers the flexibility of running different channels in-line or in an effects loop.

REMEMBER: Outputs can be configured any way you like, so don't let any of this input / output stuff scare you.

A WORD ABOUT BYPASS

Because of its flexibility, the Studio 400 can be connected in several different ways to meet the requirements of many specific applications. However, the definition of Bypass may change, depending on the application. The Studio 400 features Application Specific Bypassing so that the Studio 400 functions appropriately in nearly every application. When Bypassed, the Studio 400 simply switches the Effects in that Program OFF, but the Dry Levels defined in that Program remain untouched. If the effects are all wet (no Dry Level), the Bypass function effectively Mutes the Studio 400. If the Dry Level is up, then the Studio 400 passes the original signals through without processing. A line through the modules in a Effect Configuration Matrix indicate that the module is Bypassed.

DIGITAL INPUT / OUTPUT (OPTIONAL UPGRADE)

The optional Digital Input and Output interface makes the Studio 400 an absolute necessity for any Digital recording or mixing application. Digital I/O provides the means for communicating with other Digital devices. Digital I/O is ideal to use with the Studio 400 because all DSP effects will go to the receiving device without having to have Digital to Analog conversion. The optional Studio 400 Digital Input / Output features:

- AES/EBU and S/PDIF formats
- XLR and RCA in and output jacks
- Selectable Sampling rates
- Automatic synchronization to external sample rates

Contact your DigiTech dealer for more information.

SECTION 2 - BASIC FUNCTIONS OF THE STUDIO 400

GETTING AROUND THE OPERATING SYSTEM

The menu structure of the Studio 400 has been specially designed to be easy to use. The display shows the information you need, but to make things even easier for you, illumination in the front panel buttons offers additional operating information.

The front panel buttons give you information in one of two ways:

- 1 - If the button is not lit, its function is INACTIVE. Pressing an unlit button causes it to light brightly and its function becomes the active item in the display. If the unlit button doesn't light after you press it, the button is unavailable.
- 2 - If the button is lit, its function is ACTIVE. Pressing an active button (other than the <PROGRAM> button) reselects the already active item in the display.

PROGRAM MODE - Program mode allows you to scroll through the Factory and User Programs using the Data Wheel. When the Studio 400 is turned on, it sets itself to Program mode. Program mode is active when the <PROGRAM> button is lit and a Program name is present on the Information line (top line) of the display. You can toggle between Factory or User Programs by pressing and holding the <PROGRAM> button when it is lit. The FACTORY PRG or USER PRG indicator will light in the display according to which bank is selected. In this mode, all other buttons on the front panel are dim or off.

To select a Program, do the following:

- Make sure Program mode is selected. If the <PROGRAM> button is dim, press <PROGRAM> once to return to Program mode.
- Use the <PROGRAM> button to select the Program bank (Factory or User). Each successive press of the <PROGRAM> button toggles between the Factory and User bank of Programs.
- Using the Data wheel, scroll to the Program you want to hear.

The selected program is immediately autoloaded. The AutoLoad feature can be turned off, allowing you to view a program before actually loading it. See pg. 34 for further details.

FX EDIT MODE - This mode allows you to edit: 1. FX Modules, 2. the Modifier Module, 3. the Input Mode Module, and 4. the Output Mode Module of your Programs. Use the <FX Edit> button to enter the FX Edit mode and then to select the next module for editing. A helpful hint: If you look at the Effect Routing Matrix while you press the FX Edit button, the currently selected module will flash. The Studio 400 uses Pages to navigate within an effect. A Page is a group of up to four effect Parameters that appear on the screen at one time. To move through the Pages in a Program, use the <NEXT PAGE> and <PREV PAGE> buttons. Note that as you scroll through the Pages, the Page indicator in the lower left corner of the display changes to show the currently displayed Page.

SELECTING FX TYPES AND DEFAULTS

The Studio 400 has made custom digital signal processing easier than ever by giving you access to a complete library of professionally developed effects settings. Page one of every FX Module allows you to:

- 1) Bypass that effect module
- 2) Select an effect Type (Chorus, Reverb, Delay, etc.)
- 3) Select a Default for the selected effect Type

The Default parameter allows you to select one of several effect settings stored in the Studio 400's library. For example, there are 9 Dual Delay defaults to choose from. All Factory Programs use these Default settings. So, if you like the Delay that is being used in Factory Program 11, simply locate page one of the FX Module, then use the <4> button and the Data Wheel to recall the default (which happens to be A2-Pingpong2) in your new program. This eliminates the need to copy all those parameters from one location

to the other. It also gives you several starting places so you can get as close as possible to the custom sound you are trying to create. Once you edit one of the parameters in the FX Module, the default name is replaced with the word "Custom". This means that a default setting has been customized by the user or changed by real-time Modifiers for that program.



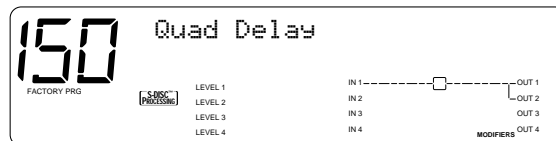
NOTE: There are two Banks available for the defaults, Bank A and Bank B. Effects stored in bank A contain the dry signal for typical in-line applications. Effects in bank B do not contain the dry signal, and boosts the effect level so it can be used with a mixing console's effect loops. EQ, Panner, Noise Gate, and Tremolo do not contain Dry level controls and therefore do not have a bank B available.

MODIFYING FX MODULE PARAMETERS EXAMPLE

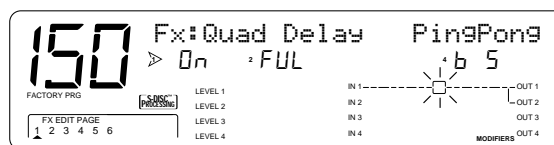
Let's modify an effect Parameter. Factory Program 150 uses a quad delay with a delay time of 700 milliseconds. The tap percentages are set to DlyA = 25%, Dly B =50%, Dly C =75%, and Dly D =100%, which gives you evenly spaced delay taps. But suppose they're too slow to fit the tempo of a piece of music you're composing. With most effects units, you'd have to recalculate each delay tap individually, but the Studio 400 makes it simple.

Here's how to change the tempo of the delays:

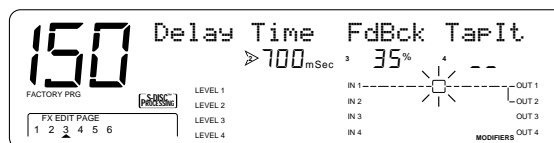
- If you're not already there, switch to Program mode and use the Data wheel to scroll to Factory Program 150. The display reads:



- Press <FX EDIT>. Note the current module being edited is flashing in the Effect Routing Matrix. The display reads:



- Press <NEXT PAGE> twice. Position 2 of the Information line shows that the current delay time setting is 700 milliseconds. Remember that the total delay time shown in the display is divided among the delay taps in the Module. The display reads:



- Use the Data Wheel to decrease the delay time. Both the Store button illuminates and the CHANGED icons turn on indicating that the Program has been modified.
- Press the <Program> button to return to Program Mode, or continue in Edit Mode by continuing to press the <FX EDIT> button.

NOTE: Make sure you store any changes you want to save before exiting the edit mode. See pg. 14 for more information.

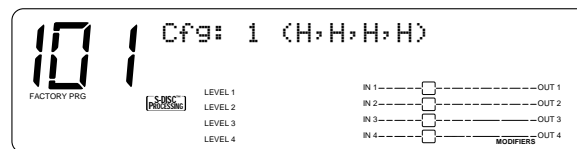
EFFECT & INPUT / OUTPUT CONFIGURATIONS

The Studio 400's ability to accommodate a number of different input and output routing configurations makes it an extremely useful and flexible tool for many different applications.

Programs 101 through 123 in the Factory Program bank represent all the FX module configurations available in the Studio 400. For diagrams of these 23 Effect Configurations, see pg. 38. When you find one that you like, you can save it in a new User Program location for later use. Remember that choosing an Effect Configuration does not define the input / output routing schemes or the actual effects used within the configuration. This means that even one configuration can be used thousands of different ways.

To select a new Effect Configuration, do the following:

- Scroll through Factory Programs 101 - 123 until you find a configuration you want to use. The display looks something like this:

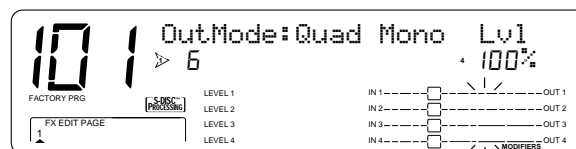


Once you have selected an Effect Configuration, you can select the input/output configuration you will be using.

- Press the FX Edit button 6 times. The input section of the Effect Routing Matrix begins flashing and the information line reads:

Input Mode: Quad Mono

- Use the Data Wheel to scroll through the 9 available input configurations.
- Press the FX Edit button one more time. The output section of the Effect Routing Matrix begins flashing and the Display looks something like this:



- Use parameter buttons <1> and <4>, and the Data Wheel to scroll through the available output configurations, and to set the output level for each program.

NOTE: Make sure you store any changes you want to make before exiting the edit mode. See pg.14 for more information.

USING MODIFIERS

Modifiers are unique tools that can be used to dramatically alter your sound based on information from signal amplitude, the settings of a Low Frequency Oscillator (LFO) or MIDI Continuous Controller information.

Every Program in the Studio 400 has a set of Modifiers. Up to 8 Modifier links can be assigned to control parameters. There are three types of Modifiers that can be linked to a parameter: MIDI CCs, LFOs, and Dynamic (signal level dependent).

12

MIDI CCs - When you use MIDI CCs, the Studio 400 responds to CC numbers 0-127 and CHP (channel pressure or aftertouch). This means that you could assign your keyboard's modulation or pitch bend wheel (or any other MIDI CC device) to control effect Parameters.

For example, you can have a synth's modulation wheel (usually MIDI CC#1) control the in level of a reverb and chorus in one program while the delay feedback is controlled in another.

LFOs - When you use LFOs, Parameter values can be controlled automatically between a defined minimum and maximum setting at a rate set by the user. The Studio 400 has 2 user definable LFOs in each program that can be assigned to any Parameter.

For example, you can create an auto panner without using an auto panner module. Simply link an effect's output pan parameter to the LFO modifier and the LFO will move that parameter back and forth. This modifier can be a very useful weapon in the ongoing battle of new sound creation. There are two LFOs available in each program that can use unique speeds and waveforms.

Dynamic Modifiers - When you use Dynamic Modifiers, the Parameter values are controlled in relation to the dynamics of the input signal. The possibilities are nearly endless, and they cannot be duplicated using any other method.

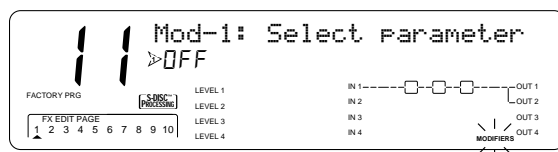
For example, you could link the Dynamic Modifier of a Program to control a chorus level. It doesn't sound like much on paper, but imagine the expressiveness of this type of effect on a vocal part. As the dynamics of the music increase, the chorus becomes less apparent. Ease up on the vocal a little and the chorus increases. ALL IN REAL TIME!

NOTE: Linking a Modifier to a Parameter causes the Parameter to change as if you were changing it using the Data Wheel. The only difference is that the <Store> button and PROGRAM CHANGED indicators do not light. Therefore, the Default name may display 'Custom' if a Parameter is consistently being changed by a Modifier. Storing the Program will store these new Parameter values.

LINKING A PARAMETER TO A MODIFIER

To link a Parameter to a Modifier, do the following:

- Press the <FX EDIT> button, and the display will look something like this:



The modifiers icon in the bottom right corner of the display begins flashing.

- Use the <NEXT PAGE> and <PREV PAGE> keys to scroll through Pages 1-8 to select which of the 8 Modifier Links you want to use. For example, Modifier Link #1.
- Use the Data wheel to scroll to the Parameter you want assigned to Modifier link #1. As you scroll, the MIN and MAX values for each Parameter show in the display.

NOTE: The MUTE and THRU effect types do not have any Parameters to connect to, so they will not appear in the parameter list.

- Press <3> to select the Minimum Value Parameter.
- Use the Data wheel to select the minimum Parameter value you want when the controller is in the minimum position. These values vary because different Parameters have different value units, such as milliseconds or percent.

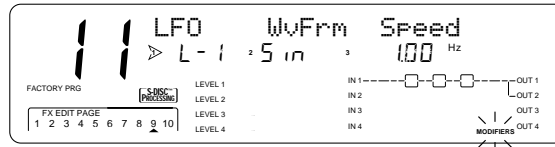
- Press <4> to select the Maximum Value Parameter.
- Use the Data wheel to select the maximum Parameter value you want when the controller is in the maximum position.
- Press <2> to select the Modifier Type Parameter.
- Using the Data wheel to scroll through the Modifier types. Select a MIDI CC number 0 -127 and CHP (Channel Pressure or Aftertouch), L - 1 (LFO1), L - 2 (LFO2), or DYN (Dynamic).

NOTE: Make sure you store any changes. See pg. 14 for more information

SETTING UP AN LFO OR DYNAMIC MODIFIER

To link a parameter, do the following:

- Press <FX Edit> until you see "modifiers" flashing in the bottom right corner of the screen.
- Use the <NEXT PAGE> and <PREV PAGE> keys to scroll to Page 9. The display reads:

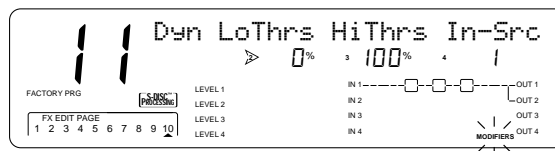


- Press <1> and use the Data wheel to select which LFO you want to adjust.
- Press <2> and use the Data wheel to change the selected LFO's waveform. You can select SINE, TRIangle, SPecial1, SPecial2 or SPecial3. Refer to pg. 19 for Waveform information.
- Press <3> and use the Data wheel to adjust the speed of the LFO cycle.

The assigned Parameter now follows the modulating waveform of the LFO you selected. See pg. 19 for waveform diagrams.

To link a Dynamic Modifier to a parameter, do the following:

- Press <FX Edit> until you see "modifiers" flashing in the bottom right corner of the screen.
- To adjust the settings of the Dynamic Modifier, use the <NEXT PAGE> and <PREV PAGE> keys to scroll to Page 10. The display reads:



- Press <2> and use the Data wheel to adjust LoThrs. This control sets the threshold above which dynamic modification of the Parameter begins.
- Press <3> and use the Data wheel to adjust HiThrs. The HiThrs control sets the point at which maximum Parameter modification occurs.
- Press <4> and use the Data wheel to select the source input you want the modifier to "listen" to, or follow.

COMPARING PROGRAMS

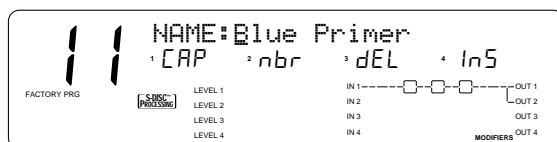
During the course of editing Programs, you may find that you want to compare the edited version of the Program to the original, stored version. Fortunately, the Studio 400 provides you with this valuable A/B feature in the Compare function. To compare an edited Program with the original Stored version, do the following:

- While the Studio 400 is in program mode, press the <PROGRAM> button once. The top line of the display reads: *COMPARING ORIGINAL PRG*. When this message is displayed, the stored Program is temporarily loaded and active.
- To return to the edited version, press the <PROGRAM> or <EDIT> button .

STORING PROGRAMS

The Store procedure allows you to rename, relocate and save any modifications you have made to Programs so that they can be accessed easily later. The following procedure tells how to store a Program:

- When you finish editing a Program, press the <STORE> key once. The display shows the current Program name (which may look something like this):



A cursor appears under the first character of the Program name.

- Using the Data wheel, scroll to the character you want in the selected position. When the correct character is displayed in that position, press <NEXT PAGE>. The cursor moves one character to the right.
- Using the <NEXT PAGE> and <PREVIOUS PAGE> buttons and the Data Wheel, continue editing all the characters in the name until it is displayed the way you want (up to 24 characters can be used). Use <1> to select capital and lower case letters, <2> to select numbers, <3> to delete a character and <4> to insert a blank space. When you're finished...
- Press <STORE> again. The top line of the display reads: STORE TO:, followed by the stored name of the current Program. This screen allows you to select the location of the new Program. Note that when the Program is stored, it is stored in the User bank of Programs because Factory Programs cannot be overwritten.
- Use the Data Wheel to select the Program number where you want to store the new Program.
- Press <STORE> again. The top line of the display briefly reads: STORING PROGRAM TO ##, after which you are taken to the Program you just stored.

The newly created Program is now loaded, and can now be recalled at any time.

SECTION 3 - EFFECTS AND PARAMETERS

ABOUT MODULES AND THE EFFECT CHARTS

The Studio 400's diverse section of effect Modules allows you to achieve nearly endless combinations of effects and routings. To accomplish that goal, we've supplied you with several different module types in an effects configuration. The processing resources are divided one of four ways per S-Disc. Fig. 3-1 below uses pies to represent the possible resource division combination

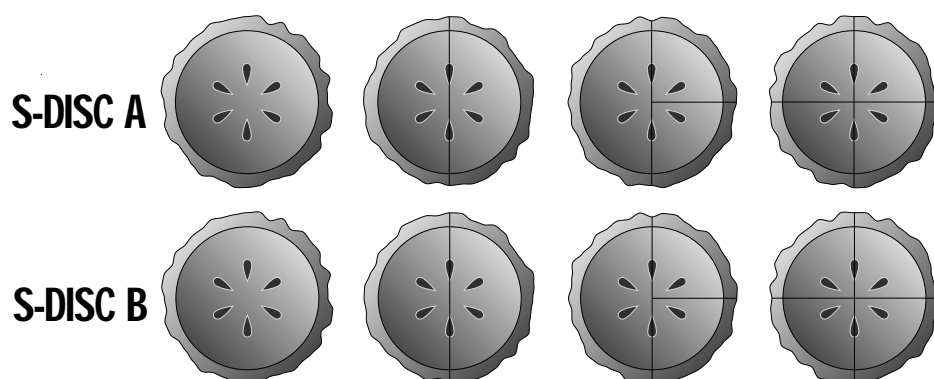


Figure 3-1 The Resource Pies

Each section of the pies represents a different size Module in an effects configuration. In the diagram, there are three different slice sizes: quarter, half, and whole. Likewise, the Module sizes available in the Studio 400 are Quarter (module type = 4th), Half (module type = HLF), and Whole (module type = FUL). This simply means that FUL module type offers effects with more flexibility and power than the HLF modules, and so on. All sizes of FX Modules feature very high quality effects, so you don't have to worry if you need to divide the Studio 400 pie four ways. For a complete list of these FX Types please see pg. 37. For a complete list of effect configurations please see pg. 38.

There are three basic types of FX Modules: Mono, Dual, and Stereo. Fig 3-2 illustrates what the signals do as they enter the Module. Although all three Modules are shown with stereo inputs, they can still be used with a mono source (such as input one of the Studio 400). The mono source would just be routed to both sides of the Module's inputs. Notice how the Dual FX Module maintains stereo compatibility while the mono FX Module always sums the signals together.

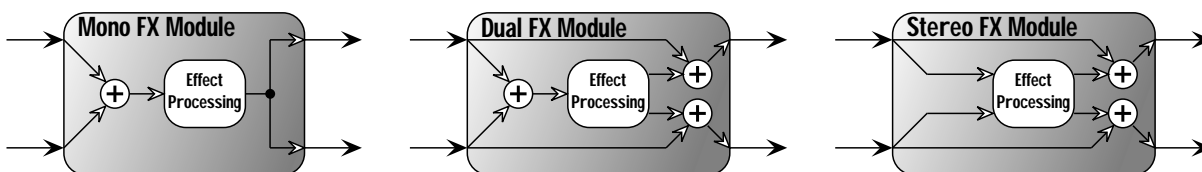


Figure 3-2 FX Module Types

ABOUT THE CHARTS

All the effects and Parameters found in the Studio 400 are described in detail in the following group of charts. Each chart is preceded by brief descriptions of the effects functions and history. Module names appear in the top left corner of the chart with a vertical column of check boxes extending directly below. If the box is checked, the Parameter appears in the Module.

Two Effect Types will be missing from these charts. They are Mute and Thru. These two Effect Types have no parameters and simply function as their names imply. The Mute type keeps all signals from passing through an Effect module while the Thru type allows only the dry signals to pass through a module.

DIGITAL AND ANALOG EFFECT LIST

Within the Studio 400, lies a vast palette of Digital and Analog effects. All of which are Studio quality. The following is a list of the Effects available: Reverbs, Choruses, Flangers, Phasers, Rotary Speaker Simulator, Tremolo, Auto-Panner, Pitch Shifters, Detuners, Delays (Digital and Analog), Equalizers, Noise Gate, and Compressor.

REVERBS

Reverberation is probably the most widely used effect because it allows you to simulate the sound reflection characteristics of almost any kind of room. In a real room, reverb is a result of sound reflecting off room surfaces such as the walls, floor, ceiling, and objects in the room. The materials, size, and shape of the room determine how long these reflections echo and decay before dying out completely. These factors also help determine the audio characteristics of the room, such as how long the high-frequency reverberations ring when compared to the low frequencies, or how much initial "slapback" the room wall produces when a sound hits.

Today's technology allows the Studio 400 to offer a complete palette of flexible, easy to use reverbs. There are five basic reverbs to choose from.

- 1) Reverb - Simple, straight ahead reverb with only the most basic parameters.
- 2) Dual Reverb - Multi-dimensional reverb with flexible frequency band-splitting capabilities. The reverb can be divided into primary and secondary stages using selectable High or Low Pass crossovers.
- 3) Stereo Reverb - A true stereo version of the Reverb.
- 4) Stereo Dual Reverb - A true stereo version of the Dual Reverb
- 5) Gated Reverbs - A very linear, high energy reverb that can be set to decay, stay flat, or ramp up the reverb decay, creating many unique ambient effects.
- 6) Room Echo - A true stereo, multi-tap delay for creating small ambient spaces. The delays are divided into four sections of early reflections. These reflections can be placed anywhere in the stereo field and can be as dense or sparse as necessary. The Room Delay also includes a feedback loop for delay regeneration.

							PARAM.	DESCRIPTION	Reverbs
Reverb	Stereo Reverb	Dual Reverb	Stereo Dual Reverb	Gated Reverb	Stereo Gated Reverb	Room Echo			
✓	✓	✓	✓	✓	✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓	✓	✓	✓	✓	✓	✓	Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.	
✓	✓	✓	✓	✓	✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).	
✓	✓			✓	✓		Type	Selects the Module's reverb type. Reverbs can be one of ten reverb types or variations, including Studio Room, Wood Room, Vocal Plate, Concert Hall, Plate Reverb, Chamber, Cathedral, Arena, Cement Shelter, or Infinite Spring. Each room type has a different decay range (just as real rooms do), so changing TYPE also changes the decay time of the room. Gated reverbs can be one of twelve different types, including Flat, Shelf, Decaying Linear, Decaying Logarithmic, Decaying Exponential, Decaying Sine, Reverse Linear, Reverse Logarithmic, Reverse Exponential, Reverse Sine, Peaking Linear, and Peaking Exponential.	
✓	✓	✓	✓	✓	✓		Density	Controls the number of discrete room wall reflections during the early portions of DECAY. Higher settings produce more reflections while low settings yield fewer initial wall echoes. Use this control in conjunction with DISPERSION to build or reduce the thickness of early reflection clusters heard near the beginning of the reverberation. Varies from 0% to 99%.	
		✓	✓		✓		Dispersion	Controls the distance (time) between the echoes set by DENSITY. If DENSITY is set low and DISPERSION is set high, the initial room echoes can be heard as discrete echoes followed by smoother room reverberations. Set DISPERSION low for a dense cluster of reflections during the early portions of DECAY. Varies from 1 to 5.	
✓	✓	✓	✓		✓	✓	Diffusion	Simulates the presence of different room materials by controlling the smoothness of reverberations through the course of DECAY. Low DIFFUSION settings are great for simulating hard, flat surfaces while higher DIFFUSION settings can be used to simulate the presence of irregular surfaces in the room such as natural rock masonry or man-made diffusers. Unlike flat surfaces, these materials reflect (diffuse) the sound in many directions because of the irregularity of the surfaces themselves. This builds smoothness over the reverb progression. Ranges from 0% to 99%.	
		✓	✓				X-Over Type	Selects which crossover type will be used for the Primary and Secondary reverb stages. The two crossover types are High Pass (HP) and Low Pass (LP).	
		✓	✓				X-Over Frequency	Selects the Frequency where the crossover begins to function. Ranges from 25Hz to 20kHz.	
		✓	✓				Prim & Secd X-Over	These two Parameters allow the crossover to be turned On or Off for each reverb stage. When Off, that particular reverb stage will be full bandwidth, otherwise its frequency response is limited by the X-Over Type and Frequency Parameters.	
		✓	✓				Prim & Secd Damp	Adjusts how quickly the room absorbs the high-frequency reverberations. In a real room, absorptive materials can be used to dampen the natural high-frequency reverberations of the room. High settings of DAMP cause the reverberations to darken tonally and become less defined over the course of DECAY. Low settings cause less dramatic room effects on the tone of the reverberations. Ranges from 1 to 7.	
				✓	✓		LowPass	Appears only in Gated Reverbs. Selects the frequency above which all frequencies are rolled off. This control can be used to darken the response of bright-sounding gated reverbs. Ranges from 100 Hz to 8 kHz in the Gated Reverb and from 100 Hz to 20 kHz in the Stereo Gated Reverb.	
				✓	✓		Time	Appears only in Gated Reverbs. Controls the length of the gated reverb in milliseconds (much like the DECAY control of a normal reverb). Ranges from 25 milliseconds to 300 milliseconds (or 500 milliseconds on the Stereo Gated Reverb).	

							Reverbs (continued)	
							PARAM.	DESCRIPTION
Reverb	Stereo Reverb	Dual Reverb	Stereo Dual Reverb	Gated Reverb	St. Gated Reverb	Room Echo		
✓							Blend	The BLEND control cross-mixes reverberations from the left side into the right side and vice-versa. This can be used to increase the realism of the simulated room by adding reverberations from different parts of the room to each channel. Varies from 0% to 99%.
			✓				Prim & Secd Blend	These two parameters adjust the amount of BLEND for the Primary and Secondary reverb stages. See BLEND above for a complete parameter description.
✓	✓						Decay	Controls the length (RT60) of the room reverberations. This one control could have been divided among Size and Reflection controls but has been simplified here for easier use. To simulate a large room, use longer DECAY settings. For small rooms, use shorter DECAY settings. For more natural sounding reverbs, you may also want to decrease the DENSITY setting as DECAY is shortened. Ranges from .5 to 23 seconds depending on the Reverb Type currently selected.
		✓	✓	✓			Prim & Secd Decay	Controls the length (RT60) for the Primary and Secondary reverberation stages. This Paramter interacts with the SIZE and REFLCT Parameters. Larger SIZE and REFLCT settings will allow longer reverb decay times while smaller settings reduce the length of the reverb decays but produce better small environment emulations. Ranges from .26 to 11 seconds.
		✓	✓	✓			Prim & Secd Size	These two Parameters change the relative room size of the Primary and Secondary reverb stages. Ranges from 1 to 5.
		✓	✓	✓			Prim & Secd Reflct	These two Parameters control the simulation of energy loss of sound each time it is reflected. Hard, smooth materials like glass and wood have more reflectivity that softer, more porous materials. This control can be thought of as determining the "liveness" of the room. Ranges from 1 to 10.
						✓	Delay A	Sets the length of time before hearing Delay group A. Ranges from 0 to 120 milliseconds.
						✓	Delay B	Sets the length of time between hearing Delay Group A and Delay Group B. Ranges from 0 to 120 milliseconds.
						✓	Delay C	Sets the length of time between hearing Delay Group B and Delay Group C. Ranges from 0 to 120 milliseconds.
						✓	Delay D	Sets the length of time between hearing Delay Group C and Delay Group D. Ranges from 0 to 120 milliseconds.
						✓	Out A-D	Controls the output level of the Delay Groups. Ranges from Off to 100%.
						✓	Bal A-D	Controls the Left-Right balance of the Delay Groups. Ranges from -99 to 99.
			✓	✓		✓	Shape	Selects the shape of the output levels for the delay group taps. Shape selections are: Flat, Peak, Decreasing, Increasing, Shelf, and Reverse Shelf.
						✓	Spread	Controls the width of the effect's stereo imaging. Ranges from 1 to 10
						✓	FB: Dly	Sets the amount of time before the delay is fed back into the signal. Ranges from 0 to 170 ms.
						✓	Amount	Sets how much delay is fed back into the signal. Ranges from Off to 50%.
✓	✓				✓	✓	OutL - R	Adjusts the overall level of the left or right side of the reverb. Ranges from OFF to 100%.
		✓	✓		✓		Prim OutL	Adjusts the overall level of the left side of the Primary reverb. Ranges from OFF to 100%.
		✓	✓				Prim OutR	Adjusts the overall level of the right side of the Primary reverb. Ranges from OFF to 100%.
		✓	✓				Secd OutL	Adjusts the overall level of the left side of the Secondary reverb. Ranges from OFF to 100%.
		✓	✓				Secd OutR	Adjusts the overall level of the right side of the Secondary reverb. Ranges from OFF to 100%.

CHORUS AND FLANGE

Both choruses and flangers use a Low Frequency Oscillator (LFO) to produce their rich, swirling effects. When you change the speed and depth Parameters of modulation effects, you're actually controlling the frequency and amplitude of the LFO. These settings determine the rate and intensity of the modulation effect.

In general, here's how choruses and flangers work: after entering the Module, the source signal is split into two paths. One is allowed to pass through the Module unaltered, while the other is delayed and pitch modulated. The modified sound is then sent to the output, along with the original. In Fig. 3-3 below, a sine wave is used to modulate the pitch of the split sound source.

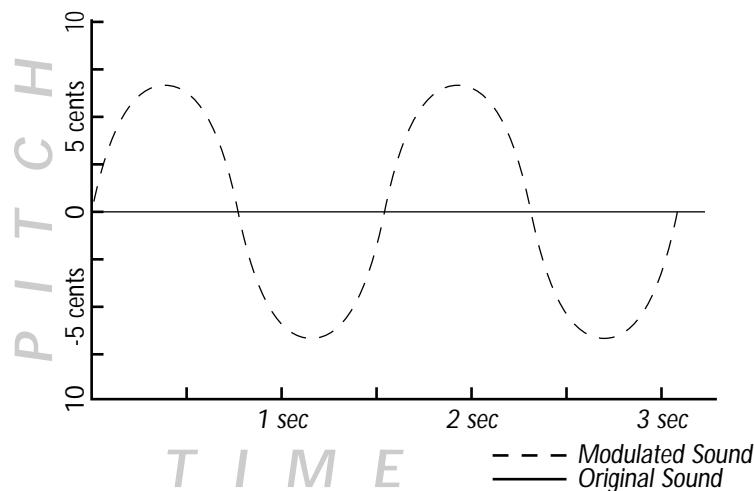


Figure 3-3 Modulation Example

The Dual Chorus creates two different pitch “voices”, while the Octal Chorus creates eight voices for extremely full, rich sounds.

The only difference between choruses and flangers is that flangers use less delay and have a feedback Parameter that sends a portion of the effected signal back to the input of the Module. When the effected signal reaches the input, it is sent through the Module again, building thickness and depth. If you increase the feedback enough, the source begins to lose its own original pitch to the dramatic pitch modulation of the feedback loop.

LFO Waveforms: There are four LFO waveforms available for Choruses, Flangers, Phasers, Tremolos, Auto Panners, and five for Modifier LFOs. They include SINE, TRIangle, SPecial-1, SPecial-2, and SPecial-3. See figure 3-4 for examples of what these waveforms look like.

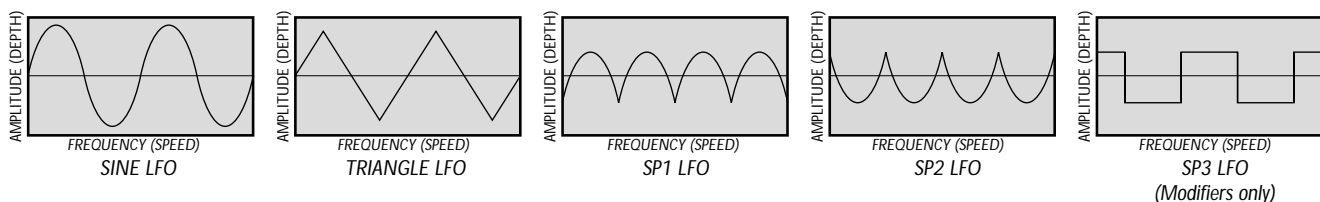


Figure 3-4 LFO Types

Dual Flange Stereo Flange		PARAM.	DESCRIPTION	Flangers
✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓	✓	Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.	
✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).	
✓	✓	Speed	Controls the Low Frequency Oscillator (LFO) speed of the flanger. Range of this control is from 0.06 to 16 Hz.	
✓	✓	Depth	Adjusts the intensity of the flange effect. High settings of DEPTH combined with high settings of FDBCK produce dramatic, synth-like results. Varies from 0 to 30 milliseconds.	
✓	✓	FdBck	Controls how much of the flanged signal is fed back to the input of the Module. The FDBACK Parameter is what gives flangers their distinctive voice. Flangers are capable of both positive and negative feedback loops, so experiment to find the sound you like best. Ranges from -99% to 99%.	
✓	✓	WvFrm	Selects which waveform the LFO follows. Options for this control include sine, triangle, SP1 (Special 1), and SP2 (Special 2). The sine wave setting is probably the most easily recognized, but the smooth response of the triangle wave or the intensity of SP1 or SP2 typically produce better results.	
✓	✓	DlyA - B	Controls the delay time of flange voice A or B. Shorter delay time settings produce a more dramatic, deeper sweeping sounds. Ranges from 0 to 60 milliseconds.	
✓		Out A - B	Adjusts the overall level of flange voice A or B. Ranges from OFF to 100%.	
✓		Pan A - B	Controls the stereo soundfield placement of flange voice A or B. Varies from -99 (all left) to 99 (all right).	
	✓	Out L - R	Adjusts the level of the left or right side of the flanger. Ranges from OFF to 100%.	

Dual Chorus Stereo Dual Chorus Quad Chorus Octal Chorus				PARAM.	DESCRIPTION	Choruses
✓	✓	✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓	✓	✓	✓	Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.	
✓	✓	✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).	
✓	✓	✓	✓	Speed	Controls the Low Frequency Oscillator (LFO) speed of the chorus. Range of this control is from 0.06 to 16 Hz.	
✓	✓	✓		Depth	Adjusts the intensity of the chorus effect. High settings produce dramatic modulation, while lower settings can be used to produce a more subtle, ambient swirling. Varies from 0 to 30 milliseconds.	
			✓	Depth 1 - 2	Octal Chorus only. DEPTH1 adjusts the intensity of chorus voices 1-4. DEPTH2 adjusts the intensity of chorus voices 5-8. Ranges from 0 to 30 milliseconds.	
			✓	Wander Speed	Controls the secondary LFO speed of chorus voices 5-8. This is a secondary oscillator for voices 5-8 that causes deviations from the oscillation path set by DEPTH2. This control can produce radical new textures when used creatively. Try setting it slightly faster or slower than SPEED. Ranges from 0.06 to 2.0 Hz.	
			✓	Wander Depth	Adjusts the intensity of the oscillation deviations produced by WANDER SPEED. WANDER DEPTH produces dramatic psycho-acoustic swirling effects when set higher than DEPTH2. Ranges from 0 to 10 milliseconds.	
✓	✓			WvFrm	Selects which waveform the LFO follows. Options for this control include sine, triangle, SP1 (Special 1), and SP2 (Special 2).	
✓	✓	✓	✓	DlyA - B	Controls the delay time of chorus voices A and B. Higher delay time settings produce a more dramatic sweeping sound. Ranges from 0 to 60 milliseconds.	
		✓	✓	DlyC - D	Controls the delay time of chorus voices C and D. Higher delay time settings produce a more dramatic sweeping sound. Ranges from 0 to 60 milliseconds.	
			✓	DlyE - H	Controls the delay time of chorus voices E - H. Higher delay time settings produce a more dramatic sweeping sound. Ranges from 0 to 60 milliseconds.	
✓		✓		Out A - B	Adjusts the overall level of chorus voice A or B. Ranges from OFF to 100%.	
✓		✓		Pan A - B	Controls the placement of chorus voice A or B in the stereo image. Varies from -99 (all left) to 99 (all right)	
		✓		Out C - D	Adjusts the overall level of chorus voice C or D. Ranges from OFF to 100%.	
		✓		Pan C - D	Controls the placement of chorus voice C or D in the stereo image. Varies from -99 (all left) to 99 (all right)	
	✓			Out LA - LB	Adjusts the left side level of chorus voice A or B. Ranges from OFF to 100%.	
	✓			Out RA - RB	Adjusts the right side level of chorus voice A or B. Ranges from OFF to 100%.	
			✓	Spread	Controls the width of the effect's stereo imaging. The higher the setting, the wider the image. The lower the setting, the more monophonic the effect becomes. Ranges from 1 to 10.	

PHASERS

Phasers create a copy of the original signal and modulate that new signal's phase relationship to the original signal. When the two signals are reunited at the output, the modified signal, moving smoothly in and out of phase, causes continuous cancellations and reinforcements at different frequencies throughout the modulating cycle.

Dual Phase Stereo Phase		PARAM.	DESCRIPTION	Phasers
✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓	✓	Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.	
✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).	
✓	✓	Speed	Controls the Low Frequency Oscillator (LFO) speed of the phaser. Range of this control is from 0.06 to 16 Hz.	
✓	✓	Depth	Adjusts the intensity of the phaser effect. High settings of DEPTH combined with high settings of FDBCK produce dramatic, synth-like results. Varies from 0 to 100 milliseconds.	
✓	✓	FdBck	Controls how much of the modulated signal is fed back to the input of the Module. The FDBACK Parameter is what gives phasers their distinctive resonating sound. Ranges from 0 to 99%.	
✓	✓	WvFrm	Selects which waveform the LFO follows. Options for this control include sine, triangle, SP1 (Special 1), and SP2 (Special 2). The sine wave setting is the most easily recognized, but the intensity of SP2 typically produce better results in phasers.	
✓		Out A - B	Adjusts the overall level of phaser voice A or B. Ranges from OFF to 100%.	
✓		Pan A - B	Controls the placement of phaser voice A or B in the stereo image. Varies from -99 (all left) to 99 (all right).	
	✓	Out L - R	Adjusts the level of the left or right side of the phaser. Ranges from OFF to 100%.	

ROTARY SPEAKER SIMULAOR / TREMOLO / AUTO PANNER

The Rotary Speaker Simluator allows you to emulate the classic rotating speaker sound, without the chiro-practic problems that come with moving bulky speaker cabinets.

Tremolos and Auto Panners are similar to one another because they use an LFO to modulate the level of the signal. This allows you to re-create the tremolo effects commonly found on vintage instrument amplifiers.

Rotary Speaker Sim. St. Tremolo Auto Panner				
✓	✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.
✓			Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.
✓			Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).
✓	✓	✓	Speed	Controls the oscillation speed of the effect. Range of this control is from 0 to 16.0 Hz.
✓	✓	✓	Depth	Adjusts the intensity of the effect. As DEPTH increases, volume changes become more dramatic. Varies from 0 to 100%.
✓			Mode	Selects which speed mode the Rotor and Horn are in. Settings are fast or slow.
✓			Spread	Sets the horn stereo microphone spread. Varies from 0 to 100%.
✓			H/R: Level	Sets the overall Rotor or Horn level. Varies from Off to 100%
			Doppler	Sets the amount of shifted pitch heard in the horn. Range is 0 to 50 milliseconds.
			X-Over	Selects the frequency where the sinal is split between the horn and rotor. Ranges from 25Hz to 20kHz.
			Acceleration: Horn/Rotor	Sets the amount of time that the rotor and horn take to come up to their full rotating speed. The ranges are 0 to 10 seconds.
	✓	✓	WvFrm	Selects which waveform the LFO follows. Options for this control include sine, triangle, SP1 (Special 1), and SP2 (Special 2). The Triangle Waveform setting produces a classic tremolo effect.

DETUNERS / PITCH SHIFTERS

Detuners are similar to pitch shifters, but the intervals between the detuned signal and the original are much smaller, usually expressed in cents (hundredths of a semitone). The Studio 400 uses percentages of semitones to express the shifted note's distance from the original. For example, with a maximum detune setting of 50%, the pitch is exactly one semitone (50 cents) up from the original.

Pitch shifters allow you to create multiple voices from a single note input. In the Studio 400, the new pitch is determined by the setting of the SHFT Parameters, which can cover a pitch range of four octaves.

						Detuners
Dual Detune	Stereo Dual Detune	Quad Detune	Octal Detune	PARAM.	DESCRIPTION	
✓	✓	✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓	✓	✓	✓	Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.	
✓	✓	✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).	
✓	✓	✓	✓	Dtn A - B	Controls the detuning amount for detuner voices A and B. Higher detune settings produce a more dissonant sound. Ranges from -50% to 50%.	
		✓	✓	Dtn C - D	Controls the detuning amount for detuner voices C and D. Ranges from -50% to 50%.	
			✓	Dtn E - H	Controls the detuning amount for detuner voices E through H. Ranges from -50% to 50%.	
✓	✓	✓	✓	Dly A - B	Controls the amount of time before detuner voices A and B are heard. Higher delay time settings produce a short slapback delay effect. Ranges from 0 to 60 milliseconds.	
		✓	✓	Dly C - D	Controls the amount of time before detuner voices C and D are heard. Ranges from 0 to 60 milliseconds.	
			✓	Dly E - H	Controls the amount of time before detuner voices E through H are heard. Ranges from 0 to 60 milliseconds.	
✓		✓		Out A - B	Adjusts the overall level of detuner voice A or B. Ranges from OFF to 100%.	
✓		✓		Pan A - B	Controls the stereo soundfield placement of detuner voice A or B. Varies from -99 (all left) to 99 (all right).	
		✓		Out C - D	Adjusts the overall level of detuner voice C or D. Ranges from OFF to 100%.	
		✓		Pan C - D	Controls the stereo soundfield placement of detuner voice C or D. Varies from -99 (all left) to 99 (all right).	
	✓			Out LA - LB	Adjusts the left side level of detuner voice A or B. Ranges from OFF to 100%.	
	✓			Out RA - RB	Adjusts the right side level of detuner voice A or B. Ranges from OFF to 100%.	
			✓	Spread	Controls the width of the effect's stereo imaging. The higher the setting, the wider the image. The lower the setting, the more monophonic the effect becomes. Ranges from 1 to 10.	

								Pitch Shifters	
								PARAM.	DESCRIPTION
Dual Pitch	Stereo Pitch	Stereo Dual Pitch	Quad Pitch	Octal Pitch	Smooth Pitch	Harmony			
✓	✓	✓	✓	✓	✓	✓		FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.
✓	✓	✓	✓	✓	✓	✓		Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.
✓	✓	✓	✓	✓	✓	✓		Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to +99 (all right).
✓		✓	✓	✓				Shft A - B	SHFTA and SHFTB control the pitch intervals between the original note and voices A and B of the pitch shifter. Pitch shifters can be used for a wide variety of effects, including doubling, octave division, and chromatic harmonies. Each Pitch Shifter has a 4-octave range, stepped in semitones from -24 to +24.
✓		✓	✓	✓				Dtn A - B	Controls the detuning amount for pitch-shifted voices A and B. As DTN moves away from zero, dissonance becomes more pronounced. Low DTN settings can be useful for thickening or enhancing the imaging of the source material. Ranges from -50% to 50%.
			✓	✓				Shft C - D	See Shift A - B
			✓	✓				Dtn C - D	See Detune A - B
								Shft E - H	See Shift A - B
								Dtn E - H	See Detune A - B
	✓					✓		Shft	See Shift A - B
	✓					✓		Dtn	See Detune A - B
							✓	Key	Key allows you to set the musical key for the harmonies. If the song you are playing is in the key of G Major, you would select G for the scale.
							✓	Scale	Scale sets the scale type for the Harmony you want to hear. Scale types include: Major, Minor, Harmonic Minor, Melodic Minor, Dorian, Mixolydian, Lydian, Lydian Augmented, Major Pentatonic, Minor Pentatonic, Blues, Whole Tone, Half-Whole, and Whole-Half.
							✓	Interval	Interval sets the basic interval of the Harmony. You can choose from one of several Harmony intervals. See pg. 42 for Harmony Interval Chart reference.
✓		✓	✓		✓	✓		Out A - B	Adjusts the overall level of pitch-shifted voice A or B. Ranges from OFF to 100%.
✓		✓	✓		✓	✓		Pan A - B	Controls the placement of pitch-shifted voice A or B in the stereo image. Varies from -99 (all left) to +99 (all right).
			✓					Out C - D	Adjusts the overall level of pitch-shifted voice C or D. Ranges from OFF to 100%.
			✓					Pan C - D	Controls the stereo soundfield placement of pitch-shifted voice C or D. Varies from -99 (all left) to +99 (all right).
					✓			Out E - H	Adjusts the overall level of pitch-shifted voices E through H. Ranges from OFF to 100%.
					✓			Pan E - H	Controls the stereo soundfield placement of voices E through H. Varies from -99 (all left) to +99 (all right).
	✓		✓					Out L - R	Adjusts the left or right output level of the pitch-shifted voice. Ranges from OFF to 100%.
		✓		✓				Out LA - LB	Adjusts the left side level of pitch-shifted voice A or B. Ranges from OFF to 100%.
		✓		✓				Out RA - RB	Adjusts the right side level of pitch-shifted voice A or B. Ranges from OFF to 100%.
								Spread	Controls the width of the effect's stereo imaging. The higher the setting, the wider the image. The lower the setting, the more monophonic the effect becomes. Range: 1 to 10.

DELAYS

A delay produces discrete, repeating echoes of the source material at a specified interval. In digital delays, the input signal is "sampled" or recorded into memory, where it is held for the amount of time you specify with the delay time setting, after which the sample is replayed at the output. The Studio 400's delays have a feedback meter that is used to send a portion of the delayed signal back to the input to be re-recorded along with new source material. The feedback setting determines how long the delay repeats take to decay to inaudibility.

										PARAM.	DESCRIPTION	Delays
Mono Delay	Dual Delay	Quad Delay	Stereo Delay	Stereo Dual Delay	Stereo Quad Delay	Analog Delay	Stereo Analog Delay	Pre Delay				
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	FX: Lvl	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Dry: Lvl	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%.	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Delay Time	Sets the maximum delay time available to each delay voice. For example, if DELAYTIME is set to 1000 ms, each delay voice can be set from 0 to 100% of that delay time. Ranges from 0 to 1.4 seconds (Maximum delay times differ between 4th, HLF, and FUL module Types.)	
✓	✓	✓	✓	✓	✓	✓	✓	✓		FdBck	Controls the fade time of the delay repeats. Higher settings take longer to fade out, while a setting of zero could be used to limit the delay to one repeat per voice. The delay provide both positive and negative feedback settings. Ranges from -99% to +99%.	
✓	✓	✓	✓	✓	✓	✓	✓	✓		TapIt	Allows you to change DELAYTIME in real-time, by tapping the TAPIT button at the tempo you want. Delay voice percentages do not change when using this control.	
							✓	✓		Smear	Sets the spread of Diffusion of the Delay Repeats. Ranges from 0 to 100%.	
							✓	✓	✓	LPF	Selects where the Low Pass Filter is positioned within the Delay Module. Positions are: Pre Delay or Post Delay.	
							✓	✓		Frequency	Selects the Frequency band that appears in the LPF. Frequencies range from 25hz to 20 khz.	
							✓	✓		Gain	Controls the gain of the output of the LPF. Ranges from -12 to 12.	
	✓	✓		✓	✓					DlyA - B	Controls the percentage of DELAYTIME allocated to delay voices A and B. For example, if DELAYTIME (above) is set to 1000 ms and DLYA is set to 75%, the voice A delay time is 750 ms. Remember, each voice in the Module can have any delay time up to 100% of DELAYTIME. Ranges from 0% to 100%.	
		✓				✓				DlyC - D	See Dly A - B. Ranges from 0% to 100%.	
✓										Out	Adjusts the overall level of the delay. Ranges from OFF to 100%.	
✓										Pan	Controls the stereo soundfield placement of the delay. Varies from -99 (all left) to 99 (all right).	
	✓		✓				✓	✓	✓	Out L - R	Adjusts the left or right level of the delay voice. Ranges from OFF to 100%.	
	✓	✓								Out A - B	Adjusts the overall level of delay voice A or B. Ranges from OFF to 100%.	
	✓	✓						✓		Pan A - B	Controls the placement of delay voice A or B in the stereo image. Varies from -99 (all left) to 99 (all right).	
		✓								Out C - D	Adjusts the overall level of delay voice C or D. Ranges from OFF to 100%.	
		✓								Pan C - D	Controls the placement of delay voice C or D in the stereo image. Varies from -99 (all left) to 99 (all right).	
				✓	✓					Out LA - LB	Adjusts the overall left output level of delay voice A or B. Ranges from OFF to 100%.	
				✓	✓					Out RA - RB	Adjusts the overall right output level of delay voice A or B. Ranges from OFF to 100%.	
					✓					Out LC - LD	Adjusts the overall left output level of delay voice C or D. Ranges from OFF to 100%.	
					✓					Out RC - RD	Adjusts the overall right output level of delay voice C or D. Ranges from OFF to 100%.	

EQUALIZERS

The Studio 400 has a broad selection of equalizer Modules to cover virtually any need. Both mono and stereo modules are available. Remember that mono equalizers connected to stereo sources will always sum the stereo signal together for equalization (thus eliminating the stereo image). If you need to maintain the stereo image, use a stereo equalizer module.

The Parametrics allow you to cover very specific regions of the sound spectrum with extreme precision and control. Up to 6 bands of either stereo, or mono parametric equalization are available.

The Graphic equalizers use 1/3, 2/3, or 1 2/3 octave ISO-standard frequency centers.

<div> <div>Mono PEQ6</div> <div>Stereo PEQ3</div> <div>Stereo PEQ6</div> <div>Mono GEQ8</div> <div>Stereo GEQ8</div> <div>Mono GEQ15</div> <div>Stereo GEQ15</div> <div>Mono GEQ31</div> </div>								PARAM.	DESCRIPTION	Equalizers
✓	✓	✓	✓	✓	✓	✓	✓	Level	Controls the signal input level fed to the Module. Varies from OFF to 100%.	
✓			✓		✓		✓	Phase	Inverts the phase of the source signal. Can be set either IN or OUT of phase.	
		✓		✓		✓		Phase L - R	Inverts the phase of the left or right side of the stereo source signal. Can be set either IN or OUT of phase.	
			✓	✓	✓	✓	✓	(Freq) Hz	Controls the amount of boost / cut applied to the selected frequency. The GEQ8 uses 1-1/3 octave ISO standard frequency centers, while the GEQ15 and GEQ31 use 2/3 octave and 1/3 octave frequencies. Boost / cut range for each band is from -12 to 12.	
✓		✓						LoShlv Freq	Controls the center frequency of the low-frequency shelving EQ band. Ranges from 25 Hz to 20 kHz.	
✓		✓						LoShlv Level	Adjusts the amount of boost or cut applied to the frequency selected by LOSHLV FREQ. Varies from -12 to 12.	
✓	✓	✓						Band# Freq	Sets the center frequency of the selected band. 6-band PEQs have four true parametric bands of EQ plus shelving high- and low-frequency controls with variable frequency. Bands 1 and 2 range from 25 Hz to 20 kHz. Bands 3 and 4 range from 1 kHz to 20 kHz.	
✓	✓	✓						Band# Width	Controls the bandwidth of the selected frequency. The higher the setting of WIDTH, the more frequency-selective the boost / cut becomes. In other words, with low (narrow) WIDTH settings, frequencies around the selected center frequency are not affected by the LEVEL setting. As WIDTH increases, frequencies around the center frequency become affected by the setting of LEVEL.	
✓	✓	✓						Band# Level	Adjusts the amount of boost or cut applied to the selected frequency. Varies from -12 to 12	
✓		✓						HiShlv Freq	Controls the center frequency of the high-frequency shelving EQ band. Ranges from 1 kHz to 20 kHz.	
✓		✓						HiShlv Level	Adjusts the amount of boost or cut applied to the frequency selected by HISHLV FREQ. Varies from -12 to 12	

NOISE GATE / COMPRESSOR

Noise gates are particularly useful for preventing mic rumble, wind noise, or hum from getting to tape in your recordings, or for gating drum kits to prevent mic bleed.

Compression does exactly what its name implies; it compresses the dynamic range of the signal. It does this by turning signals down as they become louder. After it makes the adjustments, it brings the overall signal back up.

Gate Compressor		PARAM.	DESCRIPTION	Noise Gate/Compressor	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Level	Controls the signal input level fed to the Module. Varies from OFF to 100%.		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ThshO	Sets the level at which the gate begins to open at the rate set by ATTACK. Both THSHO and THSHC are independent controls. This gives you the option to do nifty stuff like setting THSHO higher than THSHC, which could be used to let guitar notes sustain longer while still retaining the noise-gating characteristics of the gate when closed.		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ThshC	Sets the level at which the gate begins to close at the rate set by RELEASE. Both THSHO and THSHC are independent controls. THSHC cannot be set higher than THSHO.		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Thsh	Sets the minimum input level at which the compressor will engage Ranges from -27 to 0.		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ratio	Controls the amount of gain reduction applied to the input signal. Ranges from 1.5 to 40.		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gain	Controls the amount of gain that can be added to a signal after it has been compressed. Ranges from 0 to 200%		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Attn	Adjusts how far the signal level is lowered (attenuated) when the gate is closed. The higher you set ATTN, the lower the noise floor of the source when the gate is closed. Varies from 0% to 100%.		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Delay	Sets the amount of Delay before the Gate or Compressor engages. Ranges from 0.1 to 10 milliseconds.		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Attack	Controls how quickly the gate or compressor opens after the signal level reaches THSH. Varies from 0 to 2 seconds (Noise gate), Fast or Slow (Compressor).		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hold	The setting of HOLD determines how long the gate remains open after the signal level falls below THSHC. Long HOLD settings can be used to prevent the gate from "stuttering", or opening and closing rapidly, during soft passages when average signal levels are just above or below the THSHC setting. Varies from 0 to 500 milliseconds.		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Release	Determines how quickly the gate closes after the signal level falls below THSHC, or how quickly the compressor disengages. When used in conjunction with long HOLD settings, this control can be used to further prevent stuttering, or to make the closing of the gate less obtrusive. Varies from 0 to 2 seconds (Noise Gate), Fast or Slow (Compressor).		

MULTI EFFECTS MODULES

The Studio 400, Multi Effect Modules allow the User to combine either Delay and Chorus or Delay and Flange within one Effect module block. This is ideal for situations where the User needs to add another effect to the Effect Configuration, but is running low on signal processing resources. Within the module, there is a unique parameter that allows you route the signal several different ways between the two effects.

Chorus/Delay Flange/Delay		PARAM.	DESCRIPTION	Multi Effects Modules	
✓	✓	Fx: Level	Controls the signal input level fed to the Module. Varies from OFF to 100%.		
✓	✓	Dry: Level	Controls the level of the dry (unaffected) signal. Ranges from OFF to 100%		
✓	✓	Balance	Controls the left/right positioning of the dry signal in the stereo soundfield. Varies from -99 (all left) to 99 (all right).		
✓	✓	Route	Selects the route signal path within the Chorus/Delay, and Flange/Delay Multi effects modules. The 3 settings are: 1) Chorus/Flange into Delay with feedback into the Delay 2) Chorus/Flange into Delay with feedback into Chorus/Flange 3) Delay into Chorus/Flange with feedback thru the Chorus/Flange.		
✓	✓	Speed	Controls the Low Frequency Oscillator (LFO) Speed of the Chorus or Flanger. Range of this control is 0.06 to 16 Hz.		
✓	✓	Depth	Adjusts the intensity of the Chorus or Flanger effect. Varies from 0 to 30 milliseconds.		
	✓	FdBck (Flanger)	Controls how much of the flanged signal is fed back to the input of the module. The FdBack parameter is what gives flangers their distinctive voice Flangers are capable of both positive and negative feedback loops, so experiment to find the sound you like best. Ranges from 0 to 30 milliseconds.		
✓	✓	WvFrm	Selects which waveform the LFO follows. Options for this control include: Sine, Triangle, SP1 (Special 1), and SP2 (Special 2).		
✓	✓	C/F:Delay	Controls the delay time of the Chorus or Flanger voice. Ranges from 0 to 40 milliseconds.		
✓	✓	Delay Time	Sets the delay time for the delay tap. Delay time ranges from 0 to 300 milliseconds.		
✓	✓	Feedback	Controls the fade time of the delay repeats. Higher settings take longer to fade out, while a setting of zero will limit the delay to one repeat. Varies from Off to 99%.		
✓	✓	TapIt	Allows you to change the Delay time in real-time by tapping the TAPIT button at the tempo you want. Delay voice percentages do not change when using this control.		
✓	✓	Level C/F/D	Controls the overall output level of each effect block. Ranges from Off to 100%.		
✓	✓	Pan C/F/D	Controls the stereo soundfield placement of each effect block. Ranges from -99 to 99.		

SECTION 4- IN LEVELS & UTILITIES

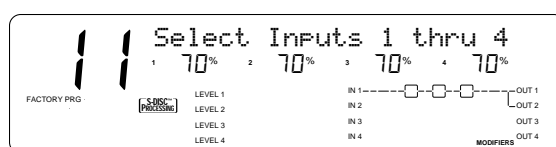
AUTOMATIC AND MANUAL INPUT LEVELING

Proper input level adjustment can be the difference between an acceptable recording and a great recording. Fortunately, the Studio 400 has the ability to automatically optimize your input levels based on the signal sent to the input(s).

The concept of Auto Leveling is simple: the Studio 400 listens to the signal for about 8 seconds, and sets the input levels accordingly. You also have the option of leveling the inputs manually if you want.

To automatically level the inputs, do the following:

- Press and hold the <IN LEVELS> button until AUTO LEVEL appears in the Information line of the display. When you release the button, the display looks something like this:



- Select the inputs you want to auto level using the <1> through <4> buttons. The number buttons you select light brightly, the <NEXT PAGE> button begins flashing, and the Information line of the display alternately reads PRESS NEXT PAGE TO BEGIN and SELECT INPUTS 1 THRU 4. You can choose to auto level any combination or all of the inputs.
- Make sure that the program material you want is playing through the inputs, then press <NEXT PAGE>. The display reads AUTO LEVELING... for eight seconds while listening to the input signal(s), after which the display returns to the manual leveling screen.

NOTE: If no signal is detected, the Input Level will be set to the factory default of 70%

You can make fine adjustments to the input level by doing the following:

- Press <IN LEVELS>. The display shows all four inputs and their current level settings.
- Using the number keys, select the input you want to level manually.
- Use the Data wheel to change the level setting of the selected input.

UTILITY

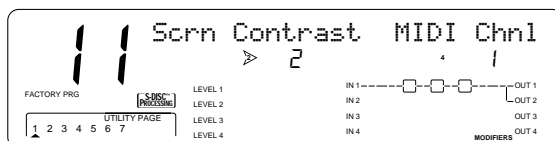
There are settings in the Studio 400 that affect many things simultaneously. They can be found in the Utility menu, and are considered "global" settings. This list of items includes: display contrast, MIDI assignments, system exclusive options, etc.

The Utility section contains eight Pages. To access Utility mode, press <UTILITY> once. Once inside, you can use the <PREV PAGE>, <NEXT PAGE>, <1> - <4> buttons, and the Data wheel to navigate through Utility mode.

ADJUSTING THE SCREEN CONTRAST

The SCRNR CONTRAST control in the Utility menu allows you to adjust the contrast of the display from different viewing angles. To change the screen contrast, do the following:

- Press <UTILITY>. Scroll to Page One of the Utility Menu using the <NEXT PAGE> and <PREVIOUS PAGE> keys. The display reads:



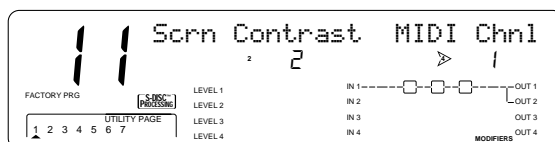
- Use the Data wheel to adjust the screen contrast to your liking.
- To return to Program mode, press <PROGRAM>.

MIDI CHANNEL

This option sets the MIDI Channel that the Studio 400 will respond to MIDI program changes and CC messages. MIDI Channel settings include: Off, 1, 2,...15, 16, and All.

To change the MIDI channel assignment, do the following:

- Press <UTILITY>. Scroll to Page One of the Utility Menu using the <NEXT PAGE> and <PREVIOUS PAGE> keys. The display reads:



- Press <4> to access the MIDI CHNL Parameter.
- Use the Data wheel to select the desired MIDI channel number.
- To return to Program mode, press <PROGRAM>.

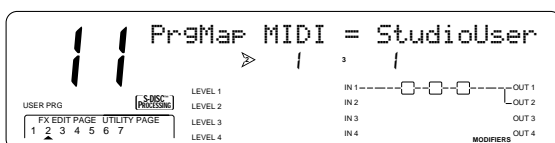
PROGRAM MAP

The Program Mapping features of the Studio 400 allow you to access any of the Studio 400's 290 Programs using the standard 128 Program Change commands through MIDI. From the Factory, the Studio 400 is set to access User Programs 1 through 100 using MIDI Program change numbers 1 through 100. MIDI Program change numbers 101 through 128 access the Factory Program bank.

To gain MIDI access to other programs not mentioned and Bypass you must use the program mapping feature.

To remap a Program number to a MIDI Program change number, do the following:

- Press <UTILITY>, and Scroll to Page Two of the Utility Menu using the <NEXT PAGE> and <PREVIOUS PAGE> keys. The display reads:



- Press <2> and use the Data wheel to select the MIDI Program change number you want mapped. Note that the number under STUDIOUSER changes along with the MIDI number.
- Press <3> and use the Data wheel to select the Studio 400 Program you want the selected MIDI Program change number to recall. As this number increases above Program 100, note that STUDIOUSER changes to STUDIOFACT, indicating that the mapped number will recall the indicated Program number in the Factory bank. Pressing <3> again will toggle between the User and Factory banks.
- When you're finished, you can return to Program mode by pressing <PROGRAM>.

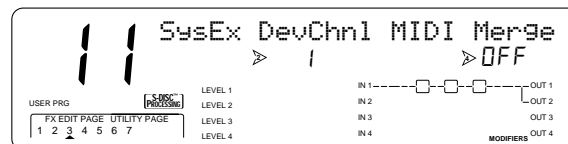
SYSTEM EXCLUSIVE DEVICE CHANNEL / MIDI MERGE

An easy way to think of the System Exclusive Device Channel option is to separate System Exclusive data from normal MIDI data. Each type of data has its own group of 16 channels upon which data can be transmitted. Normal MIDI data, like Program Changes, MIDI Volume, Modulation, etc. is transmitted and received on the MIDI channel designated by the setting of MIDI CHANNEL (pg. 31). SysEx data, on the other hand, is transmitted and received on the SysEx channel designated by the setting of SYSEX DEVICE CHANNEL. This setup frees up your regular MIDI channels for other control options, and gives you the flexibility to request SysEx data from only the devices you want in your setup, whether they share the same MIDI channel or not.

The Midi merging option allows incoming MIDI data to be merged with any MIDI data generated by the Studio 400 before being sent to the MIDI Out port.

To change the SysEx Device Channel number or MIDI Merge setting, do the following:

- Press <UTILITY>, and scroll to Page 3 of the Utility Menu using the <NEXT PAGE> and <PREVIOUS PAGE> keys. The display reads:



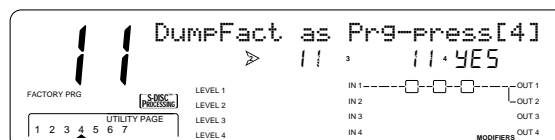
- Use the Data wheel to select the desired SysEx channel (1, 2,...15, 16), or set the MIDI merge to ON/OFF.
- When you're finished, you can return to Program mode by pressing <PROGRAM>.

PROGRAM DUMP

Allows you to dump individual Studio 400 Programs to another Studio 400 or external MIDI devices like patch librarians, computers, or sequencers for backup, storage, or organization. This option allows you to select the Program to be dumped, and (when dumping to another Studio 400) the Program location where you want the Program dumped.

To initiate an individual patch dump from the Studio 400, do the following:

- Press <UTILITY> and scroll to Page 4 of the Utility Menu using the <NEXT PAGE> and <PREV PAGE> keys. The display reads:



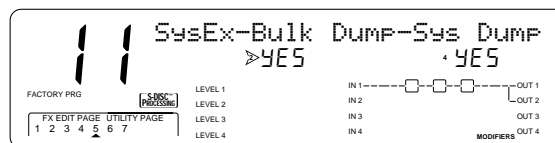
- Using the Data wheel, select the Program number you want to dump. Note that the AS PRG number changes as you scroll.
- Press <3> and use the Data wheel to select the Program location where you want the Program dumped.
- To initiate the dump, press <4>. The Information line briefly reads SENDING PROGRAM DUMP... after which it returns to the Program dump screen.

SYSTEM EXCLUSIVE BULK DUMP

This option allows you to dump all resident Programs in memory to an external recording device, like a patch librarian, computer, or sequencer for backup, storage, or organization. This option dumps all Programs simultaneously. It does not send any Studio 400 system information, such as SysEx Device channel or Program maps.

To perform a SysEx Bulk Dump of all Studio 400 Programs, do the following:

- Press <UTILITY> and scroll to Page 5 of the Utility Menu using the <NEXT PAGE> and <PREV PAGE> keys. The display reads:



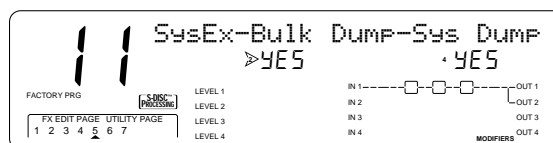
- To initiate the dump, press <2>. The Information line of the display reads SENDING BULK DUMP... after which the display returns to the Dump screen. Bulk Dumps are very large and may take several minutes to complete.
- When you're finished, you can return to Program mode by pressing <PROGRAM>.

SYSTEM DUMP

This is the option to use for dumping system data to an external MIDI or SysEx recording device. All the item settings in the Utility menu and Input Levels are sent using this option. Programs are not included in this dump.

To perform a System Dump, do the following:

- Press <UTILITY> and scroll to Page 5 of the Utility Menu using the <NEXT PAGE> and <PREV PAGE> keys. The display reads:



- To initiate the dump, press <4>. The Information line of the display briefly reads SENDING SYSTEM DUMP... after which the display returns to the Dump screen.
- When you're finished, you can return to Program mode by pressing <PROGRAM>.

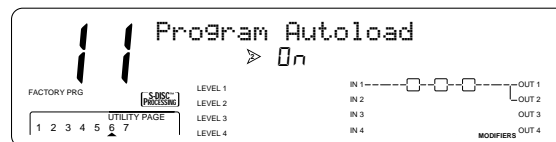
PROGRAM AUTOLOAD

From the factory, the Studio 400 ships with this option turned on. It simply means that any time you change to a new Program, it is automatically loaded into active memory and begins performing its function. When set to off, newly selected Programs must be loaded manually using the <PROGRAM> button.

This is a great feature for live sound reinforcement situations where the engineer can skip to a non-consecutive Program number without hearing the effects of all the Programs in between.

To change the setting of the Program Autoload function, do the following:

- Press <UTILITY> and scroll to Page 6 of the Utility Menu using the <NEXT PAGE> and <PREVIOUS PAGE> keys. The display reads:



- Use the Data wheel to turn the option on or off.
- When you're finished, you can return to Program mode by pressing <PROGRAM>.

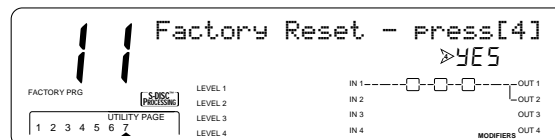
FACTORY RESET

Allows you to erase all User Program and Utility settings at once and restore the Studio 400 memory to its factory condition.

WARNING! This procedure will destroy and reset ALL User Programs in the Studio 400's memory. Be sure you want to erase the memory, and start fresh before continuing with this procedure.

To perform a factory reset, do the following:

- Press <UTILITY> and scroll to Page 8 of the Utility Menu using the <NEXT PAGE> and <PREV PAGE> keys. The display reads:



- To initiate the reset, press <4>.
- This is your last chance to change your mind. If you are sure, press <3>. If not, you can abort the procedure by pressing <4>. If you press <3>, the Information line of the display briefly reads: FACTORY RESETTING... after which the unit resets, and returns to Program 1.

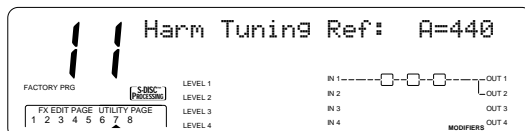
In extreme situations, the Studio 400 can be reset using a special power-up procedure. This will also completely reset the Studio 400, eliminating any custom settings created by the user. The procedure is as follows:

- Press and hold the <1> Parameter button while applying power to the Studio 400.
- Release the <1> Parameter button after an asterisk appears in the information line on the screen.
- Press the <Program> button, and the Studio 400 will re-initialize itself.

HARMONY TUNING REFERENCE

When using Harmony intelligent pitch shifting, the Reference note pitch is set at A=440. If you wish to change the reference note, you can access this function in the Utility menu. Reference can be set from A=427 to A= 453. The procedure is as follows:

- Press <UTILITY>, scroll to page 7 of the Utility page using the <Prev Page> or <Next Page> buttons. The display reads:



- Using the Data wheel, you can modify the Reference note anywhere from A=427 to A=453.
- To exit Harmony Tuning Reference, Press <Program> button.

SECTION 5 - APPENDIX

MIDI IMPLEMENTATION CHART

Function...		Transmitted		Recognized		Remarks
Basic Channel	Default Channel	X	X	1-16	1-16	Memorized
Mode	Default Messages Altered		X X N/A	Mode 2, Mode 4 Mode2, Mode 4 X		Memorized
Note Number	True Voice	X	N/A	X	X	
Velocity	Note ON		X		X	
	Note OFF	X	X	X	X	
After Touch	Key's		X		X	
	Ch's	X	X	O	X	
Pitch Bender			X		X	
Control Change			X		O	1*
Prog Change	True #	X	N/A	0	0-127	2*
System Exclusive			O		O	See S. 400 SysEx docs
System	:Song Pos		X		X	
	:Song Sel				X	
Common	:Tune		X		X	
System	:Clock		X		X	
Real Time	:Commands		X		X	
Aux	:Local ON/OFF		X		X	
Mes-	:All Notes Off		X		X	
sages	:Active Sense		X		X	
	:Reset		X		X	
Notes 1* Each Parameter can be linked to any control change. These assignment tables are stored in memory. 2* For Program map 1-128 (Program Change can be mapped to Factory Programs, User Programs, or Bypass function).						
Mode 1 : OMNI ON, POLY		Mode 2 : OMNI ON, MONO		O : Yes		
Mode 3 : OMNI OFF, POLY		Mode 4 : OMNI OFF, MONO		X : No		

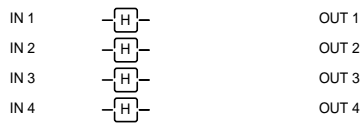
EFFECTS AND DEFAULTS LIST

On the following page, is a list of effects available in the Studio 400. Both the module Type and the effect name appears on Page one of all FX Modules. Please note maximum delay times vary depending on the module Type being used. Please refer back to pg.15 for more information concerning Module types.

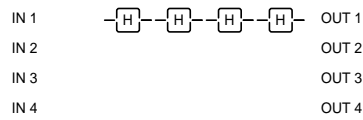
Effect Name	Module Type - 4th	Module Type - HLF	Module Type - FUL	Effect Type	Defaults
GEQ8	✓	✓	✓	Mono	Flat, LowPump, Sizzle, Smiley, InvertPhase
GEQ15	✓	✓	✓	Mono	Flat, LowPump, Sizzle, Smiley, InvertPhase
GEQ31	✓	✓	✓	Mono	Flat, LowPump, Sizzle, Smiley, InvertPhase
St GEQ8	✓	✓	✓	Stereo	Flat, LowPump, Sizzle, Smiley, PhasInvertL
St GEQ15	✓	✓	✓	Stereo	Flat, LowPump, Sizzle, Smiley, PhasInvertL
St PEQ3	✓	✓	✓	Stereo	Flat, LowBoost, Smiley, 60HzNotch, PhasInvertL, SmlBoost, LowNudge
PEQ6	✓	✓	✓	Mono	Flat, LowBoost, Smiley, 60HzNotch, InvertPhase
St PEQ6	✓	✓	✓	Stereo	Flat, LowBoost, Smiley, 60HzNotch, PhasInvertL
Dual Cho	✓	✓	✓	Dual	Medium, Shallow, MildNWide, MediumWell, DeepDepth, Deep, MaxDepth, Shimmery, SloVibrato, FstVibrato
Quad Cho	✓	✓	✓	Dual	Medium, MildNWide, MediumWell, Thick, DeepDepth, Deep, MaxDepth, Shimmery, SloVibrato, FstVibrato
Octal Cho	✓	✓	✓	Dual	Medium, Shallow, DeepDepth, MaxDepth, Deep, Shimmery, SpcScrmblr
StDual Cho	✓	✓	✓	Stereo	Medium, Shallow, MediumWell, DeepDepth, Deep, MaxDepth, Shimmery, SloVibrato
Dual Fla	✓	✓	✓	Dual	HiSweep30%, HiSweep70%, LoSweep30%, LoSweep70%, Throaty, Nasally, Gonzo, IntenseL, IntenseR, FlaChorus1, FlaChorus2
Stereo Fla	✓	✓	✓	Stereo	HiSweep30%, HiSweep70%, LoSweep30%, LoSweep70%, Throaty, Nasally, Gonzo, FlaChorus1, FlaChorus2
Dual Pha	✓	✓	✓	Dual	ShallowSlo, ShallowFst, Mild Slow, Mild Fast, Medium, Deep, Shimmery, PhaChorus1, PhaChorus2, Psychedelic
Stereo Pha	✓	✓	✓	Stereo	ShallowSlo, ShallowFst, Mild Slow, Mild Fast, Medium, Deep, Shimmery, PhaChorus1, PhaChorus2, Psychedelic
RotarySpkr	✓	✓	✓	Stereo	SloLeslie, MedLeslie
St Tremolo	✓	✓	✓	Stereo	DeepSlow, DeepMedium, Deep Fast, Mild Slow, MildMedium, Mild Fast
Auto Pan	✓	✓	✓	Stereo	Wide Slow, WideMedium, Wide Fast, NarrowSlow, NarrowMed, NarrowFast
Dual Dtn	✓	✓	✓	Dual	-5Cents, -12Cents, +/-5Cents, +/-10Cents
Quad Dtn	✓	✓	✓	Dual	Shallow, Medium, Wide, Deep
Octal Dtn	✓	✓	✓	Dual	Shallow, Medium, Wide, Deep
StDual Dtn	✓	✓	✓	Stereo	Medium, Deep, -5Cents, -12Cents
Smooth Pch	✓	✓	✓	Stereo	ShftDn-12, ShftDn-5, ShftDn-24, ShftUp+5, ShftUp+7, ShftUp+12
Dual Pitch	✓	✓	✓	Dual	5th/OctUp, 5thUpOctDn, 3rd/5thUp, Min3/5thUp, 4th/OctDn, OctUp/Down, OctDownDtn, 1&2OctsUp
Quad Pitch	✓	✓	✓	Dual	MajChord, MinChord, Octs/Dtn, 5th/OctDtn, 5Octaves
Octal Pch	✓	✓	✓	Dual	Chord/Det1, Chord/Det2, MinChrdDtn, 5thsOcts
St Pitch	✓	✓	✓	Stereo	5thUp, Min3rdUp, Maj3rdUp, OctaveUp, 4thDown, OctaveDown, 2 OctDown
StDual Pch	✓	✓	✓	Stereo	5th/OctUp, 5thUpOctDn, 3rd/5thUp, Min3/5thUp, 4th/OctDn, OctUp/Down, OctDownDtn, 1&2OctsUp
Harmony	✓	✓	✓	Stereo	Cmaj3rdUp, Cmaj6thUp, Emin3rdUp, Cmaj6thDn, Cmaj3rdDn, Emix3rdUp
Delay	✓	✓	✓	Dual	FUL -> 1400ms/15%, CombFilter, Doubling, Slapback, 300msEcho, 400ms/30%, 500ms/25%, 800ms/20%, 1SecEcho, MaxRepeats, 1400ms/0% HLF -> 700ms/15%, CombFilter, Doubling, Slapback, SlapRight, 300msEcho, 400ms/30%, 500ms/20%, 600ms/15%, MaxRepeats 4th -> 370ms/20%, CombFilter, Doubling1, Doubling2, Slapback, SlapRight, 370ms/50%, MaxRepeats
Dual Delay	✓	✓	✓	Dual	FUL -> PingPong, 1SecTicToc, Doubling, Slapback, DoubleSlap, RoundNRnd, Hard2Tap, Thick Taps HLF -> PingPong1, PingPong2, Doubling, Slapback, Hard2Tap, RoundNRnd, SlapEcho, RoomDelay, SoftEcho 4th -> PingPong, CombFilter, Doubling1, Slapback, DoubleSlap, RoundNRnd, Hard2Tap, ThickTaps
Quad Delay	✓	✓	✓	Dual	FUL -> RoundNRnd, SynchroTap, RtoLPanTap, TripleSlow, PingPong, 400msThick, HorseTrot, Shav&Hrcut HLF -> RoundNRnd, SynchroTap, RtoLPanTap, PingPong, 400msThick, HorseTrot, BoBopBeDoo, Shav&Hrcut
Stereo Delay	✓	✓	✓	Stereo	FUL -> 700ms/20%, CombFilter, Doubling, SlapRight, 400ms/50%, 500ms/30%, 600ms/15%, MaxRepeats HLF -> 370ms/20%, CombFilter, Doubling, 185ms/0%, SlapBack, SlapRight, LongSlap, 370ms Echo, 370ms/50%, Max Repeats
StDual Dly	✓	✓	✓	Stereo	FUL -> Skip, SwingPong, PingPong1, PingPong2, DoubleSlap, RoundNRnd, Hard2Tap, ThickEcho HLF -> PingPong, Doubling, DoubleSlap, RoundNRnd, Hard2Tap, ThickTaps, ConcrctSlap, QuickERs
StQuad Dly	✓	✓	✓	Stereo	RoundNRnd, SynchroTap, PingPong, 400msThick, HorseTrot, Shav&Hrcut, Ratatat, Random
Analog Dly	✓	✓	✓	Dual	FUL -> 1400ms/25%, SoftEcho, Eternity HLF -> 700ms/25%, SoftEcho, Eternity 4th -> 350ms/25%, SoftEcho, Eternity
StAlog Dly	✓	✓	✓	Stereo	FUL -> 700ms/25%, SoftEcho, Eternity HLF -> 350ms/25%, SoftEcho, Eternity
Chorus/Dly	✓	✓	✓	Dual	MedChoEcho, LitCloEcho, MedChoSlap, DeepChoDly, ShimmyEcho, ModDly300m, DeepModDly, DlyCho300m
Flange/Dly	✓	✓	✓	Dual	FlaLitD300, FlaMedD300, HeavyFIDly, LoSweepDly, ThroatyDly, DoubGonzo, FlangJelly
Pre Delay	✓	✓	✓	Dual	0ms, 30ms, 60ms, 90ms, 120ms, Warm0ms, Warm60ms, Warm120ms, 0msHPass1, 0msHPass2, 0msHPass3, 0msHPass4, 0msLPass1, 0msLPass2, 0msLPass3, 0msLPass4
Reverb	✓	✓	✓	Dual	SmoothHall, Bar'nGrill, OakFloorRm, VocalReverb, FoilPlate, GoldPlate, SmphnyHall, RichChmbr, Sanctuary, SaltPalace, CmmtGarage, PlutoVerb
DualReverb	✓	✓	✓	Dual	BrightHall, LngDrkHall, ConcrctHall, MiniHall, FlatChambr, WarmChambr, BigCathedrl, SmlCathedrl, GoldPlate, ThinPlate, VocalPlate PercPlate, StudioAmb, StudioRoom, WoodRoom, FlutterRvb, VeryThin, CementRoom, HugeArena
St Reverb	✓	✓	✓	Stereo	SmoothHall, Bar'nGrill, OakFloorRm, VocalReverb, FoilPlate, GoldPlate, SmphnyHall, RichChmbr, Sanctuary, SaltPalace, CmmtGarage, PlutoVerb
StDual Rvb	✓	✓	✓	Stereo	BrightHall, LngDrkHall, ConcrctHall, MiniHall, FlatChambr, WarmChambr, BigCathedrl, SmlCathedrl, GoldPlate, ThinPlate, VocalPlate PercPlate, StudioAmb, StudioRoom, WoodRoom, FlutterRvb, VeryThin, CementRoom, HugeArena
Gated Rvrb	✓	✓	✓	Dual	100msGated, 200msDcyEx, 200msDecay, 200msGated, 300msDcyEx, 300msDecay, 300msGated, Reverse150, Reverse300, 300msPeak
St GatRvrb	✓	✓	✓	Stereo	200msDecay, 200msGated, 400msDcyEx, 300msShelf, DrkGate400, 500msDecay, 500msGated, Reverse300, Reverse500, Peaking500
Room Echo	✓	✓	✓	Stereo	WideSlap, LiveSlap, Springy, Stage, Voxxy
Noise Gate	✓	✓	✓	Stereo	LoThrsh, MedThrsh, HiThrsh, FastSwell, VolumSwell,
Compressor	✓	✓	✓	Stereo	Light, Medium, Heavy

EFFECT CONFIGURATION CHART

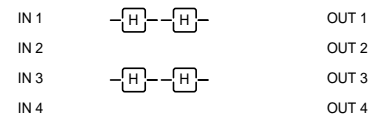
Configuration 1



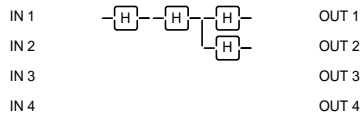
Configuration 2



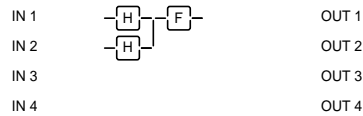
Configuration 3



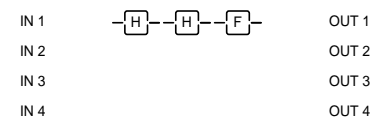
Configuration 4



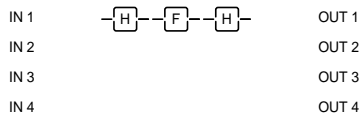
Configuration 5



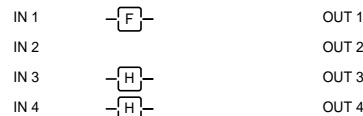
Configuration 6



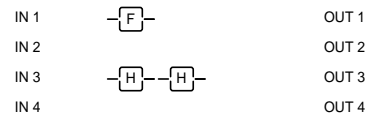
Configuration 7



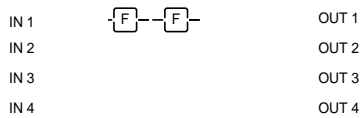
Configuration 8



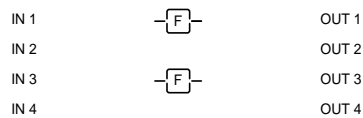
Configuration 9



Configuration 10



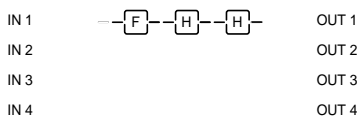
Configuration 11



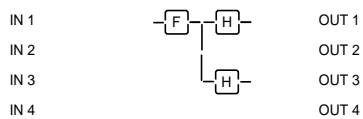
Configuration 12



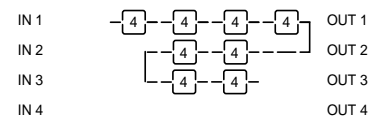
Configuration 13



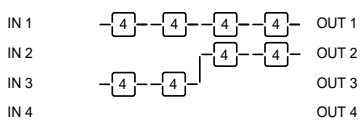
Configuration 14



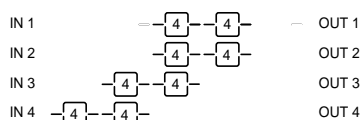
Configuration 15



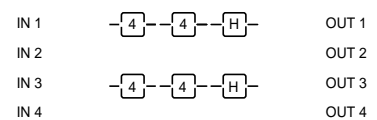
Configuration 16



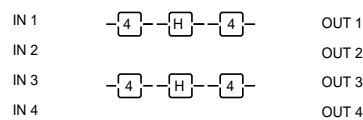
Configuration 17



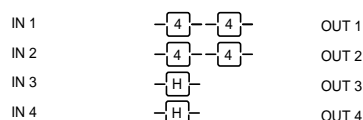
Configuration 18



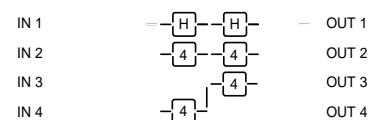
Configuration 19



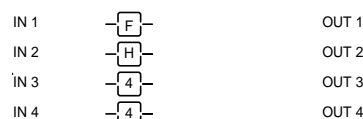
Configuration 20



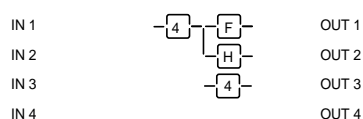
Configuration 21



Configuration 22



Configuration 23



4 = 4th Type Modules
H = HLF Type Modules
F = FUL Type Modules

STUDIO 400 FACTORY PROGRAM LIST

CLASSIC REVERBS

1- 1:Rvb 2:GtRv 3:Dly 4:Cho	.Cfg-1
2- Perfect Hall	.Cfg-23
3- Stage in a Small Hall	.Cfg-23
4- Rich Chamber	.Cfg-23
5- Precious Plate	.Cfg-23
6- Grand Cathedral	.Cfg-23
7- Large Wood Room	.Cfg-23
8- Percusive Plate	.Cfg-23
9- Vocal Chamber	.Cfg-9
10- Concert Hall	.Cfg-23

MULTI-EFFECT PROGRAMS

11- Blue Primer	.Cfg-6
12- Harmony Central	.Cfg-13
13- Dripping Wet Chorus	.Cfg-10
14- Analog Delay w/ Reverb	.Cfg-10
15- Funky Room	.Cfg-14
16- Flanger into Reverb	.Cfg-10
17- Phaser Heaven	.Cfg-6
18- Detuned Panaroma	.Cfg-17
19- Octivider Plus	.Cfg-5
20- So Many Effects...	.Cfg-15

MODULATION PROGRAMS

21- Leslified Room	.Cfg-10
22- Dynamic Rotation	.Cfg-6
23- 16 Voice Chorus	.Cfg-11
24- Chorus in Motion	.Cfg-21
25- Real Vibrato	.Cfg-6
26- Double Flanging	.Cfg-5
27- Old Time Tremolo	.Cfg-6
28- Auto Pandoric	.Cfg-6
29- Double Duty Phaser	.Cfg-5
30- Modulation Mania	.Cfg-17

MORPHING PROGRAMS

31- Delay/Chorus DynaMorph	.Cfg-5
32- Dynamic Detune	.Cfg-6
33- Chorus/Reverb DynaMorph	.Cfg-11
34- Modimus Maximus	.Cfg-17
35- Double LFO Detuner	.Cfg-10
36- Detune/Phaser AutoMorph	.Cfg-5
37- Dynamic Panner	.Cfg-17
38- Dynamic Reverb Time	.Cfg-17
39- Delay/Reverb AutoMorph	.Cfg-11
40- Dynamic Delays	.Cfg-11

DELAY PROGRAMS

41- Mono Delay Triplet	.Cfg-10
42- Moving Delays	.Cfg-7
43- Ping Pong Delays	.Cfg-10
44- Synchopated Delays	.Cfg-10
45- Delays on the Rise	.Cfg-10
46- 8 Stroke Drum Roll	.Cfg-11
47- No Decay Delays	.Cfg-10
48- 2.8 Second Delay	.Cfg-10
49- Splattered Delays	.Cfg-10
50- DoubleDoubler	.Cfg-10

AMBIENT PROGRAMS

51- Detuned Doubler	.Cfg-10
52- Telephone Lines	.Cfg-11
53- T.V. in a Room	.Cfg-6
54- Slow Dopler Pan	.Cfg-6
55- Small Ambience	.Cfg-12
56- Live Ambience	.Cfg-12
57- In the Stadium	.Cfg-11
58- Huge Gated Room	.Cfg-10
59- Empty Stage	.Cfg-11
60- Mono Room	.Cfg-3

SPECIAL PROGRAMS

61- Modulated Reverb	.Cfg-3
62- Auto Fade-In Pad	.Cfg-2
63- Deep Darth Voice	.Cfg-10
64- Chipmunk Chatter	.Cfg-10
65- Blowing Bubbles	.Cfg-2
66- Chorus/Delay Splits	.Cfg-5
67- Double Intel Harmony	.Cfg-11
68- Stereo Tape Echo	.Cfg-12
69- Jazzy Pitch Shifting	.Cfg-13
70- Fantasia	.Cfg-13

QUAD INPUT PROGRAMS

71- (4) NGate/Compressors	.Cfg-17
72- (4) Mono GEQ15s	.Cfg-1
73- Candy Cho:Dtn:Pha:Dly	.Cfg-1
74- St.GEQ15, Chorus & Delay	.Cfg-8
75- Hall:Chamber:Plate:Room	.Cfg-1
76- (4) Auto Panners	.Cfg-1
77- Drums: OvrHeads/Kick/Snr	.Cfg-8
78- 4x1 PingPong Mixer	.Cfg-17
79- Multi-Effects Mania	.Cfg-17
80- (4) Individual Reverbs	.Cfg-1

SPATIAL PROGRAMS

81- Centerless Delay	.Cfg-3
82- Centerless Reverb	.Cfg-1
83- Simple Auto Panning	.Cfg-10
84- Modulating Analog Delay	.Cfg-12
85- Waitin in the Green Room	.Cfg-7
86- Really Dense Reverb	.Cfg-1
87- 4x2 Mini Mixer	.Cfg-3
88- Left Out of Phase	.Cfg-12
89- Ghostly Gate	.Cfg-3
90- Infiniverb	.Cfg-12

MISC APPLICATION PROGRAMS

91- Vocal Eliminator	.Cfg-17
92- St. High Pass Filter	.Cfg-12
93- St. Low Pass Filter	.Cfg-12
94- Auto Fade-In	.Cfg-12
95- Auto Sample & Hold	.Cfg-10
96- Quadraphonic Imager	.Cfg-3
97- Stereo Two-Way X-Over	.Cfg-11
98- Dual 31 band GEQs	.Cfg-11
99- St.NGt>Comp>GEQ15	.Cfg-6
100-Room Allignment Delays	.Cfg-11

40

EFFECT BLOCK CONFIGURATIONS

- 101) Cfg. 1 (H, H, H, H)
- 102) Cfg. 2 (H, H, H, H)
- 103) Cfg. 3 (H, H, H, H)
- 104) Cfg. 4 (H, H, H, H)
- 105) Cfg. 5 (H, H, F)
- 106) Cfg. 6 (H, H, F)
- 107) Cfg. 7 (H, F, H)
- 108) Cfg. 8 (F, H, H)
- 109) Cfg. 9 (F, H, H)
- 110) Cfg. 10 (F, F)
- 111) Cfg. 11 (F, F)
- 112) Cfg. 12 (F)
- 113) Cfg. 13 (F, H, H)
- 114) Cfg. 14 (F, H, H)
- 115) Cfg. 15 (All 1/4)
- 116) Cfg. 16 (All 1/4)
- 117) Cfg. 17 (All 1/4)
- 118) Cfg. 18 (4,4,H,4,4,H)
- 119) Cfg. 19 (4,H,4,4,H,4)
- 120) Cfg. 20 (4,4,4,4,H,H)
- 121) Cfg. 21 (H,H,4,4,4,4)
- 122) Cfg. 22 (F, H, 4, 4)
- 123) Cfg. 23 (4, F, H, 4)

EFFECT SAMPLERS (100% WET)

- 124) St. 15 Band GEQ
- 125) St. 6 Band PEQ
- 126) Dual Chorus
- 127) Quad Chorus
- 128) Octal Chorus
- 129) St. Dual Chorus
- 130) Dual Flange
- 131) Stereo Flange
- 132) Dual Phaser
- 133) Stereo Phaser
- 134) RotarySpeaker
- 135) St. Tremolo
- 136) Auto Pan
- 137) Dual Detune
- 138) Quad Detune
- 139) Octal Detune
- 140) St. Dual Detune
- 141) Smooth PitchShift
- 142) Dual PitchShift
- 143) Quad PitchShift
- 144) Octal PitchShift
- 145) St. PitchShift
- 146) St. Dual PitchShift
- 147) Harmony
- 148) Delay
- 149) Dual Delay
- 150) Quad Delay
- 151) Stereo Delay
- 152) St. Dual Delay
- 153) St. Quad Delay
- 154) Analog Delay
- 155) St. Analog Delay
- 156) Chorus/Dly
- 157) Flange/Dly
- 158) Reverb

- 159) Dual Reverb
- 160) Stereo Reverb
- 161) St. Dual Reverb
- 162) Gated Reverb
- 163) St. Gated Reverb
- 164) Room Echo
- 165) Noise Gate
- 166) Compressor

MORE REVERBS (100% WET)

- 167) St.Bright Hall
- 168) St.Long Dark Hall
- 169) St.Concert Hall
- 170) St.Mini Hall
- 171) St.Flat Chamber
- 172) St.Warm Chamber
- 173) St.Big Cathedral
- 174) St.Small Cathedral
- 175) St.Gold Foil Plate
- 176) St.Thin Plate
- 177) St.Vocal Plate
- 178) St.Snare Plate
- 179) St.Studio Ambience
- 180) St.Studio Room
- 181) St.Large Wood Room
- 182) St.Flutter Room
- 183) St.Very Thin Reverb
- 184) St.Huge Arena
- 185) St.Cement Room
- 186) St.Big Spring
- 187) St.Gated Rvb Linear
- 188) St.Gated Rvb Reverse
- 189) St.Gated Rvb Decayed
- 190) St.Room Delay
- 191) (4) Long Reverbs

STUDIO 400 SPECIFICATIONS

A/D Converter: 18 bit, 128 x oversampled delta-sigma stereo

D/A Converter: 20 bit 64 x oversampled

Sampling Frequency: 44.1 kHz

DSP Section:

Static-Dynamic Instruction Set computer(S-DISC[®])

Digital Signal Path Width: 24 bits (144.5 dB)

Internal Data Path Width: 48 bits (289 dB)

Dynamic Delay Memory: 64k x 24 bits (1.4 seconds)

Static Delay Memory: 256 24-bit registers (5.8 milliseconds)

Data ALU Processing: 11.3 MIPS

Address ALU Processing: 16.9 MIPS

Multiplier Size: 24 bits x 24 bits

Input Section:

Connectors: 4- 1/4" TRS Plug balanced, XLR Balanced

Nominal Level: -10 dBV, +4 dBu, software variable

Maximum Level: +18 dBu

Impedance: 10 k Ω

Output Section:

Connectors: 4- 1/4" TRS Plug balanced, XLR Balanced

Nominal Level: -10dBV, +4 dBu switchable

Maximum Level: +18 dBu

Impedance: 470 Ω

General:

Frequency Response: 20 Hz. - 20kHz. ± 3 dB

S/N ratio: Greater than 91 dB; ref =max signal, 22 kHz measurement bandwidth, unweighted

96dB Max signal "A" Unweighted

Total Harmonic Distortion Less than 0.03% (1 kHz)

Midi In, Out/Thru

Memory Capacity:

Factory: 191 Programs

User: 100 Programs

Power Requirements:

US and Canada: 120 VAC, 60 Hz

Japan: 100 VAC, 50/60 Hz

Europe: 230 VAC, 50 Hz

UK: 240 VAC, 50 Hz

Power Consumption: 30 watts

Dimensions: 19" (482 mm) W x 3.50" (88 mm) H x 9.25" (234 mm) D

Net Weight: 10.25 lbs (4.64 kg.)

Shipping Weight: 13.0 lbs. (5.90 kg.)

Interval	Major	Minor	Harm.Minor	Mel.Minor	Dorian	Mixolydian	Lydian
↑Oct	C	C	C	C	C	C	C
↑7th	B	B _♭	B	B	B _♭	B _♭	B
↑6th	A	A _♭	A _♭	A	A	A	A
↑Oct	G	G	G	G	G	G	G
↑Oct	F	F	F	F	F	F	F#
↑Oct	E	E _♭	E _♭	E _♭	E _♭	E	E
↑Oct	D	D	D	D	D	D	D
Ref	C	C	C	C	C	C	C
↓2nd	B	B _♭	B	B	B _♭	B _♭	B
↓3rd	A	A _♭	A _♭	A	A	A	A
↓4th	G	G	G	G	G	G	G
↓5th	F	F	F	F	F	F	F#
↓6th	E	E _♭	E _♭	E _♭	E _♭	E	E
↓7th	D	D	D	D	D	D	D
↓Oct	C	C	C	C	C	C	C

Int.	Lydian Aug.	Int.	Major Pent.	Int.	Minor Pent.	Int.	Blues	Int.	Whole Tone	Int.	Hlf-Whl Dim.	Int.	Whl-Hlf Dim.
										↑Oct	C	↑Oct	C
↑Oct	C									↑♭7th	B _♭	↑6th	B
↑7th	B					↑Oct	C	↑Oct	C	↑6th	A	↑5th	A
↑6th	A	↑Oct	C	↑Oct	C	↑♭7th	B _♭	↑♭7th	A#	↑5th	G	↑♭6th	G#
↑#5th	G#	↑6th	A	↑♭7th	B _♭	↑5th	G	↑#5th	G#	↑#4th	F#	↑♭5th	F#
↑#4th	F#	↑5th	G	↑5th	G	↑♭5th	F#	↑#4th	F#	↑3rd	E	↑4th	F
↑3rd	E	↑3rd	E	↑4th	F	↑4th	F	↑3rd	E	↑#2nd	E _♭	↑♭3rd	E _♭
↑2nd	D	↑2nd	D	↑♭3rd	E _♭	↑♭3rd	E _♭	↑2nd	D	↑2nd	D _♭	↑2nd	D
Ref	C	Ref	C	Ref	C	Ref	C	Ref	C	Ref	C	Ref	C
↓♭2nd	B	↓♭3rd	A	↓2nd	B _♭	↓2nd	B	↓2nd	A#	↓2nd	B _♭	↓♭2nd	B
↓♭3rd	A	↓4th	G	↓4th	G	↓4th	G	↓3rd	G#	↓♭3rd	A	↓♭3rd	A
↓3rd	G#	↓♭6th	E	↓5th	F	↓♭5th	F#	↓♭5th	F#	↓4th	G	↓3rd	G#
↓♭5th	F#	↓♭7th	D	↓6th	E _♭	↓5th	F	↓♭6th	E	↓♭5th	F#	↓♭5th	F#
↓♭6th	E	↓Oct	C	↓Oct	C	↓6th	E _♭	↓♭7th	D	↓♭6th	E _♭	↓5th	F
↓♭7th	D					↓Oct	C	↓Oct	C	↓6th	E	↓6th	E _♭
↓Oct	C									↓7th	D _♭	↓♭7th	D
										↓Oct	C	↓Oct	C

USER NOTES....

44

USER NOTES...

8760 South Sandy Parkway
Sandy, Utah, 84070

Telephone (801) 566-8800
FAX (801) 566-7005

International Distribution: 3 Overlook Dr Unit 4
Amherst, New Hampshire 03031 U.S.A.
FAX (603) 672-4246

DigiTech™, Studio 400, and S-DISC™ are registered trademarks
of DOD Electronics Corporation

Copyright © 1995
DOD Electronics Corporation

Printed In U.S.A. 11/95
Manufactured in the U.S.A.

Studio 400 18-2153-A